NEW ZEALAND
JOURNAL OF
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Minister of Agriculture

This Month's Cover

Loading carcasses of frozen meat for shipment at Lyttelton, the main port of Canterbury, is the subject of this month's cover from a colour photograph by R. V. Francis Smith. In recent years New Zealand has established a reputation as the world's principal meat exporting country and almost one quarter of the export produce income is drawn from meat. Britain is by far the largest market, absorbing 85 per cent. of all the meat. Consequently it is essential to have a quick turn-round of shipping and this has been achieved with the use of modern equipment and the co-operation of British shipping firms who carry the meat across the world.

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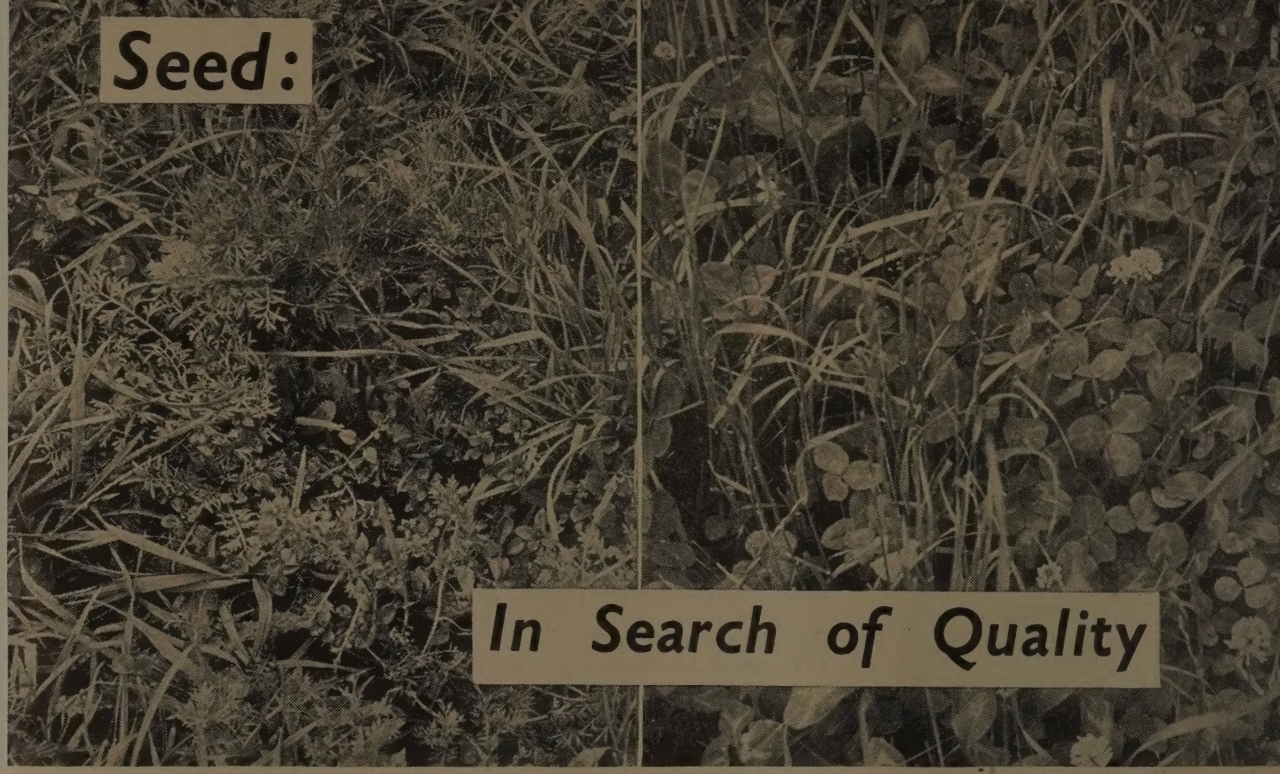


Seed: In Search of Quality

By A. V. LITHGOW,
Officer in Charge, Department of Agriculture Seed-testing Station, Palmerston North

IN the seed-growing areas of New Zealand farmers realise the importance of sowing good seed. Where much of their income is derived from the sale of seeds they have found that if their product does not reach a certain standard, it often has no market value. Farther afield, especially in the northern half of the North Island, large quantities of inferior seed are still being sown to the detriment of both pasture and pocket. Undoubtedly one of the major reasons for the continued market for inferior seed has been the high cost of good seed and a tendency for the farmer to look for seed at bargain prices. The demand for cheap seed has been so great that some merchants have thought it desirable to make up mixtures of low-germinating seed that could be sold at a price attractive to the buyer. Though this practice is less undesirable than the marketing of seed containing a high proportion of weed seeds, it is felt that an understanding by the farmer of the factors affecting seed quality would make him realise that the only cheap seed is good seed.

THREE factors decide seed quality. Good seed will be of high purity, will germinate freely, and will be capable of producing plants of good type.

Purity

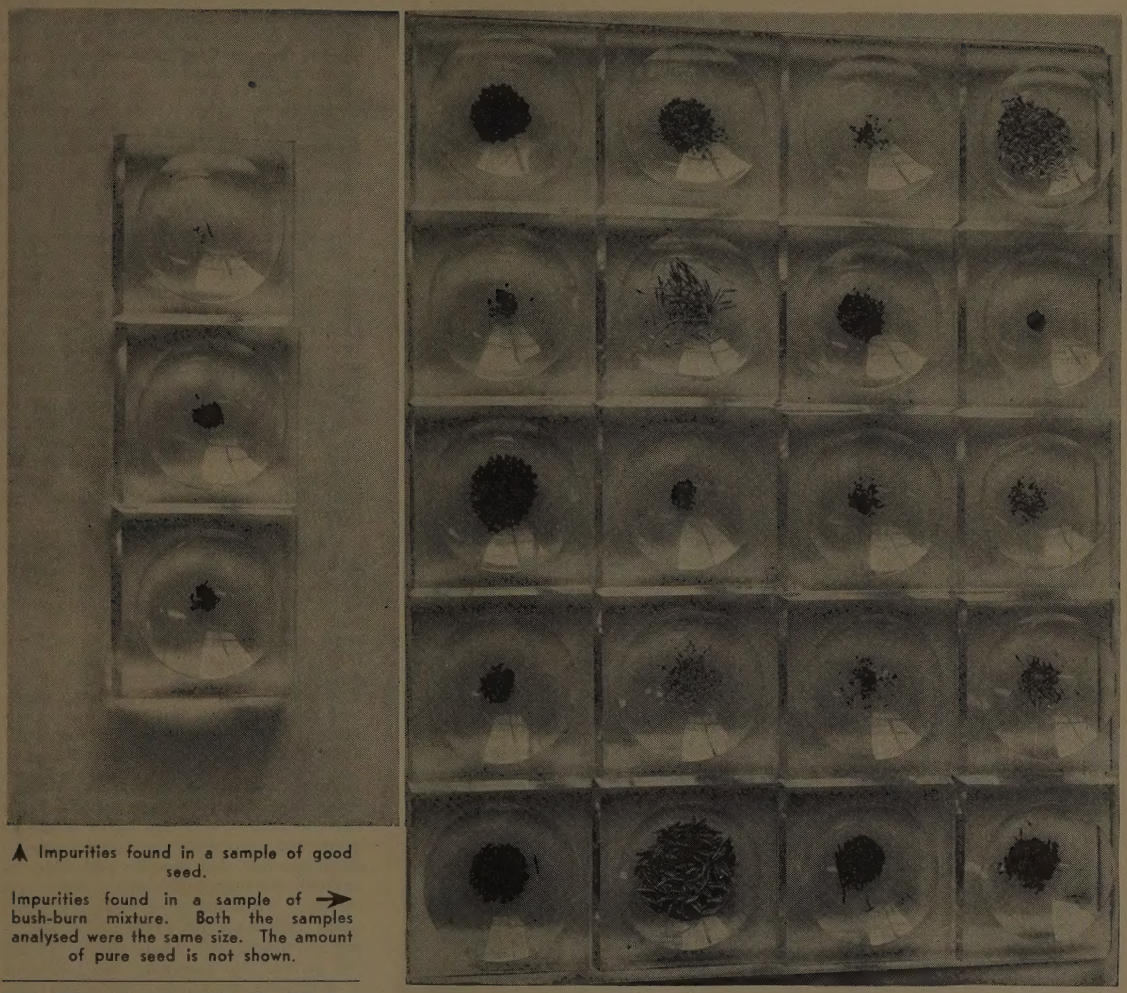
In the minds of many people the purity of a line of seed is summed up in the recorded 98 per cent. or 99 per cent. pure seed shown in a certificate of analysis, but to the discriminating farmer the word "purity" raises questions of what the other 1 per cent. or 2 per cent. in the line is comprised of. Not only does he want high purity, but he wants to know what the impurities are.

During analysis of seed the sample is sorted into four separations:—

1. Pure seed. This is seed of the kind being analysed.
2. Other crop seeds, which are seeds of other kinds regarded as useful; for example, white clover seed in perennial ryegrass seed or suckling clover seed in white clover seed. Such seeds may have some merit, and usually do no harm except that in quantity they may reduce the value of the line. For seed production areas certain other crop seeds such as Italian ryegrass in perennial ryegrass, ryegrass in cocksfoot, and red clover in lucerne are regarded as serious impurities.
3. Weed seeds, which are seeds of those species recognised by custom or regulation as weed seeds. Some of these may be particularly serious under any conditions, even when recorded on the certificate as being present only as a trace; others may be serious because of the larger quantities present, or because the area in which the seed is to be sown is free of such weeds.[1] The kind of weed seed present is often more important than the quantity.
4. Inert matter as its name implies is dead material and usually consists of pieces of straw and earth and of broken seed. Inert matter is not usually of serious moment, though if it is present in quantity, it may indicate inadequate machine dressing. Much broken seed in a line may be an indicator of further damage to other seed, leading to abnormal growths in the germination test.

The farmer buying seed should therefore consider these factors first in relation to sowing comparatively large quantities of undesirable or dangerous seeds and secondly to the fact that all material other than pure seed is costing him money. If the purity of a line of seed is 99 per cent., every 100lb. of seed that he buys con-

HEADING PHOTOGRAPH: Left, a weedy pasture, and right, a good pasture.



▲ Impurities found in a sample of good seed.

Impurities found in a sample of → bush-burn mixture. Both the samples analysed were the same size. The amount of pure seed is not shown.

tains 99lb. of pure seed. In this case the true price of the pure seed is not greatly increased. On the other hand if the purity is only 90 per cent., he is receiving only 90lb. of pure seed when he pays out for 100lb. Such seed invoiced to him at 6s. per pound really costs him 6s. 8d. per pound for the seed he wants—a very material increase in price. Extreme cases of low purity have shown as little as 11oz. of seed in the 100lb. of alleged seed purchased.

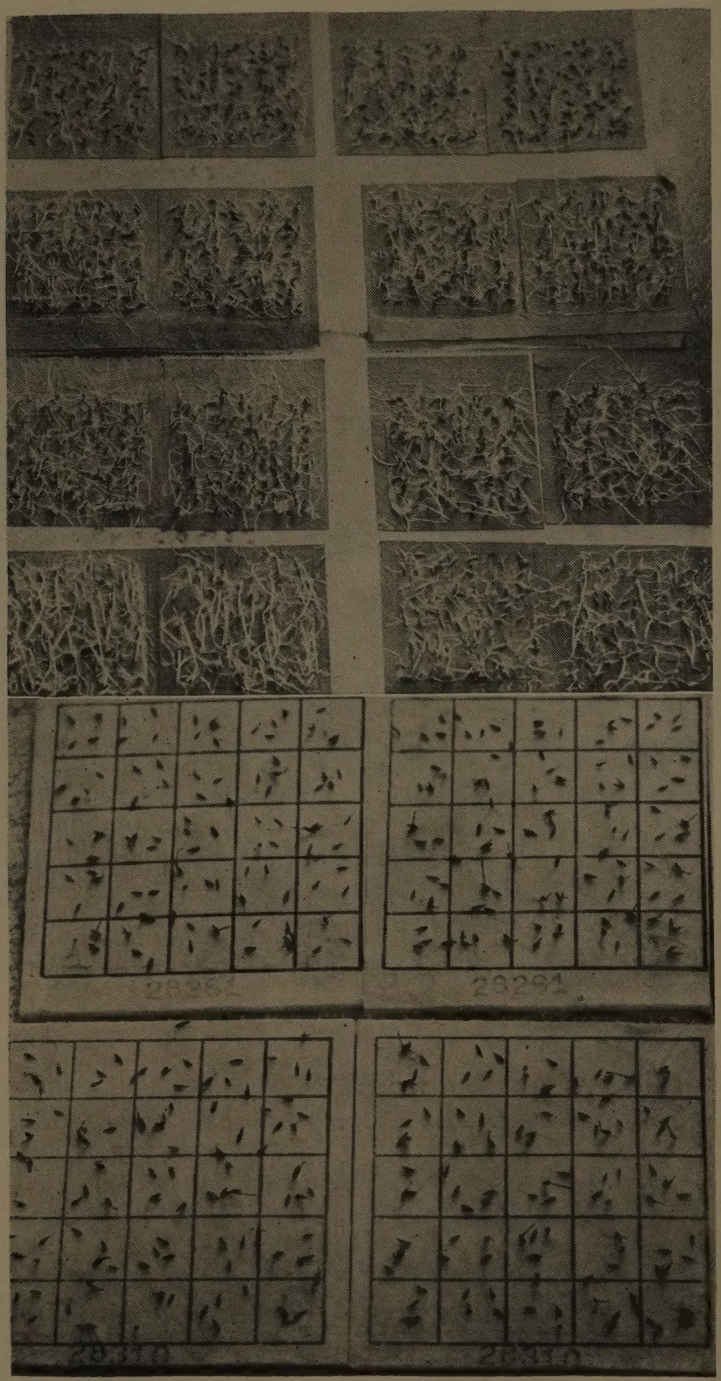
The purity of seed should therefore be considered in relation to price as as well as to the sowing of undesirable seeds.

Germination

If seeds will not germinate, they are useless. The value of a line of seed is influenced not only by how many seeds germinate, but how freely they germinate. In recording the germination of a line of seed it is usual to show two figures: one stated to be the interim germination and giving the percentage of seeds germinating in a certain number of days and the other stated to be the final germination and giving the percentage of seeds germinating in a certain longer period. The normal time required for germination varies with the kind of seed from a few days with white clover and turnip seed to several months for some tree seeds, and the periods allowed for the interim and final germinations accordingly vary with the kind of seed.

The interim count indicates the vigour of the line or the readiness with which it will germinate, whereas the final count gives the percentage of seed which can be expected to germinate under good conditions. When seed of high interim germination is sown it can be expected to give good establishment even under conditions not of the best, whereas seed of low interim but high final germination requires the best of conditions to ensure establishment.

With most sowings a rapid and complete strike is essential for good results because of the suppression of weeds. It is recommended therefore that where possible seed with a high interim count be purchased. One of the first signs of old age in seed is lack of vigour, which shows up in the laboratory test as a low interim count.



Laboratory tests forecast field results.

Unfortunately many species when freshly harvested also tend to have low interim germinations. With modern methods of harvesting, seed is often dressed before it has had sufficient time to condition and early tests made in the laboratory reveal an unwillingness to germinate freely. This condition is called dormancy and may last from a few weeks with some seeds to months with others. It is desirable where the interim count is low to know whether or not the seed has been freshly harvested.

A general rule for seed purchase in so far as germination is concerned is to select lines with a high interim as well as a high final germination. This should not blind the buyer to the fact that, other things being equal, a line with low final germination but with interim germination approximately the same can be a good buy if sufficient allowance is made in the price for the lower living seed content of the line. This applies particularly with ryegrass, where infestation by blind seed disease may kill a proportion of the seeds, but the balance will germinate and establish normally.

Another factor influencing the value of a line can be the hard seed content. At the close of a germination test on some legumes there often remain seeds which are quite unchanged by attempts to germinate them. They have taken up no moisture and remain precisely as they were when put to test. These seeds are known as hard seeds and are not dead, but have not germinated because moisture has been unable to penetrate the seed coat.

These seeds have a certain "strike" value varying with the species. With lucerne and sweet blue lupin seed the hard seeds germinate reasonably freely after sowing and can be regarded as normal germinating seeds. With red clover it is considered that the hard seeds have half the value of germinating seeds and with white clover a third the value. In assessing the value of a proposed purchase, therefore, the full percentage of hard seeds in sweet blue lupins and lucerne may be added to the germination, half the percentage with red clover and cowgrass, and a third with white clover.

In germination analysis there are often seedlings which are judged by the analyst to be incapable of normal growth and of no strike value in the field. These may be the result of mechanical damage, poor storage conditions, or old age. They are called abnormal growths and are useless.

Type

Even the most detailed visual inspection of seed can give no indication of the type of plant which that seed may eventually produce. Apparently-similar seeds can give rise to com-

pletely dissimilar plants in their worth to the farmer. Under the varied farming conditions and practices in New Zealand there developed in the first century after its colonisation a wide diversity of types in some major pasture plants. By the 1920s it became recognised that certain districts were producing seed of a strain or type superior to that saved elsewhere. Hawke's Bay and Poverty Bay perennial ryegrass were examples.

By 1930 the Department of Agriculture had investigated types of perennial ryegrass plants grown from seed from different parts of New Zealand and elsewhere. The better strains were located and a scheme of certification was introduced to identify the seed from areas of good strain. The certification scheme has grown until today any farmer can purchase the best strains available of seed of many kinds merely by buying certified seed. Certification does not mean that germination is high nor does it mean that the seed contains no dangerous weed species. It guarantees only the type of plant which can result from its use.

Certificates of Analysis

Today seed is bought and sold on the results of analysis. No longer does the merchant pour seed through his fingers and assess its value by colour. Instead he inspects the certificate which is issued on the results of analysis.

On this page is reproduced a certificate of analysis of a sample drawn from a line of six sacks of N.Z. Certified Permanent Pasture white clover seed bearing the registered number R.100. The certificate was issued on completion of the test on 4/6/56. In the top right-hand corner of the certificate appears the S.T.S. No. 56/32145. Immediately below is a summary of the analysis. The pure seed (that is, white clover seed) in the sample comprised 99.4 per cent. of the bulk, and the germination of this seed is recorded as 95 + 3 per cent. (that is, 95 per cent. of seed actually germinating plus 3 per cent. of hard seed). The pure living seed content of 95 per cent. is obtained by multiplying the "pure seed" percentage by the germination percentage plus the allowance for hard seed (in this case one-third of the "hard seed" percentage) and dividing by 100, the result being expressed to the nearest whole number.

Then follows the detailed purity analysis. In addition to the 99.4 per cent. of pure seed the sample contained 0.4 per cent. of other crop seed (made up of 0.3 per cent. of *Trifolium dubium* and traces of two other seeds), 0.1 per cent. of weed seed (comprising traces of three kinds of seeds), and 0.1 per cent. of inert matter (being broken seed and straw).

Botanical terms rather than common names are used to specify the impurities present, so that there can be no confusion over the impurity. Even within New Zealand common names vary from district to district, whereas botanical terms are internationally recognised.

Toward the bottom of the certificate appear the details of the germination test. The interim count shows that 90 per cent. of the seeds germinated in 3 days, and the final count shows that 95 per cent. germinated in 7 days. This records not only high final germination, but also rapid germinating capacity or vigour.

Next appears the percentage of hard seed (3 per cent.). Another 1 per cent. of the seeds though germinating showed abnormal growths which are of no strike value in the field, and the remaining 1 per cent. of the line comprised dead seed.

The date of completion of the test follows, and there is space also for any special endorsements which may be required.

NEW ZEALAND DEPARTMENT OF AGRICULTURE
EXTENSION DIVISION
SEED TESTING STATION S.T.S. No. 56/32145

CERTIFICATE OF ANALYSIS.—GOVT. CERTIFIED SEED

SEED: White Clover
CLASS: Permanent Pasture
REG. No. R.100
SACKS: Six

PURE SEED: 99.4 %
GERMINATION: 95+3 %
PURE LIVING SEED 95 %

PURITY ANALYSIS

PURE SEED	OTHER CROP SEED	WEED SEED	INERT MATTER
99.4 %	0.4 %	0.1 %	0.1%

CROP SEED:
Trifolium dubium 0.3%
Lolium perenne
Trifolium pratense

WEED SEED:
Rumex acetosella
Plantago lanceolata
Sherardia arvensis

INERT MATTER: Broken seed, straw.

GERMINATION TEST OF PURE SEED

INTERIM COUNT	FINAL COUNT	HARD SEED	ABNORMAL GROWTHS	REMAINDER
90 % IN 3 DAYS	95 % IN 7 DAYS	3 %	1 %	1 %

PALMERSTON NORTH.
4.6.56.

A.S. Lithgow
OFFICER IN CHARGE.

The examination reported above was made on a sample drawn from sealed sacks by an officer of the Department of Agriculture.

Purity and germination certificate covering a line of Certified white clover seed.

This seed is good seed. It is certified as being of good type and details of purity and germination show it to contain no undesirable seeds. It is vigorous seed with a high germination. The date of the certificate shows whether the test has been recently completed. The sacks are sealed and the line of seed can be identified by the registered number. A farmer can sow this seed with confidence. A merchant can buy it knowing that his clients when they purchase this seed will obtain the highest quality.

Seed Mixtures

Though some farmers prefer to make up their own seed mixtures, reliable seed merchants will always make up a seed mixture to an individual farmer's specification, and some carry mixtures made up to standard specifications which may or may not suit a particular set of conditions. Whatever may be said for or against the

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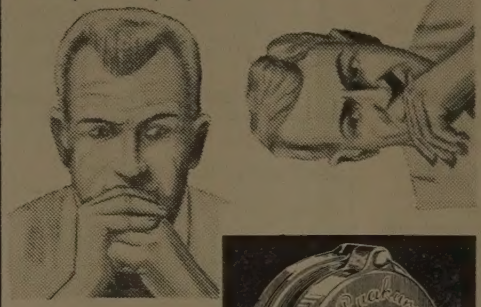

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★ ABNORMALITIES SUCH AS DOUBLE "LET-DOWN"

★ END-POINT OF MILKING

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farmer making up his own mixture some "ready-made mixtures" can only be described as disgraceful.

Such "mixtures" have been made up to no balanced proportions, and with no consideration to the viability of the seed, and on examination reveal a strange assortment of seeds. Not only may they contain appreciable quantities of crop seeds more or less useless for pasture purposes and of inert matter, but in extreme cases have been known to contain upward of 70 different kinds of weed seeds, including such dangerous ones as ragwort, Californian thistle, and ox-eye daisy.

Frequently they contain the cleanings from machine dressing plants bagged up and offered for sale to the unsuspecting farmer. They may be described as "bush-burn" mixtures, but their suitability for even this purpose can only be judged by their analyses.

So-called Cheap Seed

Recently a sample was submitted by a farmer who purchased cheap seed because of its price, and on the advice of a neighbour submitted it to the Seed-testing Station in Palmerston North for a free advisory test.

Analysis showed the sample to comprise:—

	Percentage in mixture
Ryegrass	55.2
Suckling clover	12.0
Crested dogstail	7.3
Red clover	3.0
White clover	1.3
Weed seeds	16.4
Inert matter	4.8

	Percentage germination of seed
Ryegrass	9
Suckling clover	34
(plus 7 per cent. of hard seed)	
Crested dogstail	15
Red clover	7
(plus 6 per cent. of hard seed)	
White clover	18
(plus 2 per cent. of hard seed)	

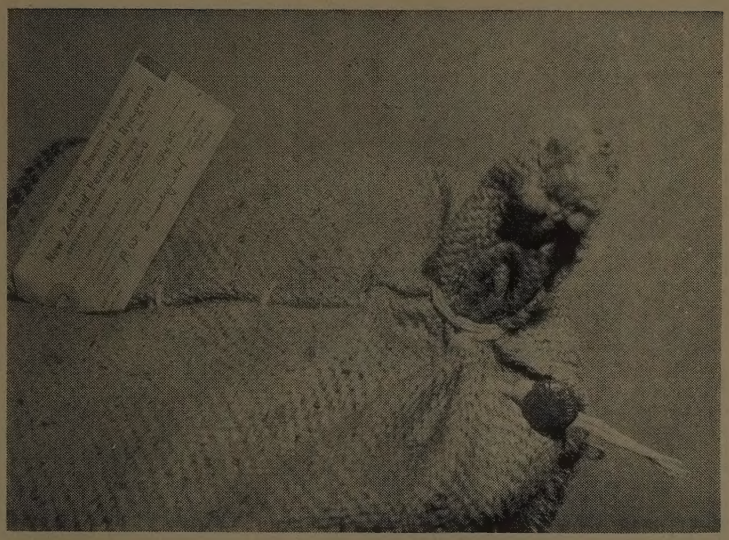
These figures mean that every 100lb. of the mixture contained 11lb. of living crop seeds (5lb. of ryegrass, 4lb. 6oz. of suckling clover, 1lb. 1oz. of crested dogstail, 5oz. of red clover, and 4oz. of white clover). But that is not all. In every 100lb. of that mixture were over 16lb. of weed seeds, made up of:—

Californian thistle	25,600 seeds
Dock	8lb. 3oz.
Sorrel	4lb. 11oz.
Ribgrass	2lb. 10oz.
46 other weed seed species	

Mixtures such as these are never cheap. Even the better type of cheap seed mixture is not an investment. Invariably it is an unbalanced mixture comprising seeds of doubtful germination.

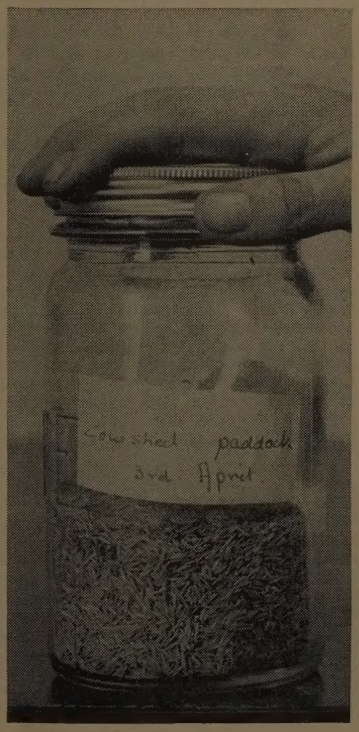
Purchasing Seed

Before purchasing seed the farmer is advised to call on his experience in the district and "tailor" his mixtures to suit the particular requirements of the occasion. His own paddocks will tell him what grasses and clovers will give him production and carrying capacity. Ready-made and particularly unbalanced mixtures can give no consideration to individual demands and the sowing of these can often be a poor substitute.



▲ Sack of certified seed with seal in position. This is the guarantee of strain.

▼ Keep samples of all seed sown. When the strike is poor a sample should be sent to the Seed-testing Station, Palmerston North, for analysis.



If the farmer has any doubts, the local Instructor in Agriculture will assist with his advice. When the purchase is made the actual certificates should be inspected. For those species which are certified, certified seed should always be bought and the "just as good" lines ignored. If the certificate bears a date more than 6 months previous, the seed should not be bought until a fresh sample has been drawn and submitted to the Seed-testing Station at Palmerston North for a further analysis.

If the farmer is mixing his own seed, he should check the registered number on the tags on the sealed sacks against the details on the certificate.

If the firm mixes the seed, the tags from the sacks should be delivered with the mixed seed to the farmer.

It is good practice, before the seed is sown, to take a sample of the mixture, place it in a glass jar, and keep in a cool, dry place.

If the strike is good, destroy this sample, but where there are any doubts send the sample to the official Seed-testing Station, Palmerston North, for a free advisory test. The advice received will decide future action and may prevent the farmer from blaming good seed for a poor strike.

The Handling and Marketing of Shell Eggs

By F. C. BOBBY,
Superintendent, Poultry Industry,
Department of Agriculture, Wellington

FACTORS which can influence the market quality of eggs before and immediately after they are laid were considered in the first part of this article, which appeared in the March issue of the "Journal". This second and concluding part of the article deals with the stage between production and the dispatch of eggs to an egg floor. It is a most important one and has a considerable influence on the quality of eggs when they reach the retailer and consumer.

BETWEEN the time that eggs are produced and forwarded to the egg floor there can occur the initial deterioration which leads to more rapid falling off in internal quality after the eggs have left the farm. In countries where egg marketing has been raised to a high level of efficiency great care is taken of eggs held on the farm and subsequently during transit to egg floors. The methods employed may not yet be practical in New Zealand, but a similar high standard of handling should be the aim. Producers should be able to give a lead without having to face undue labour or financial worries.

Moving Eggs from Laying Houses to Store

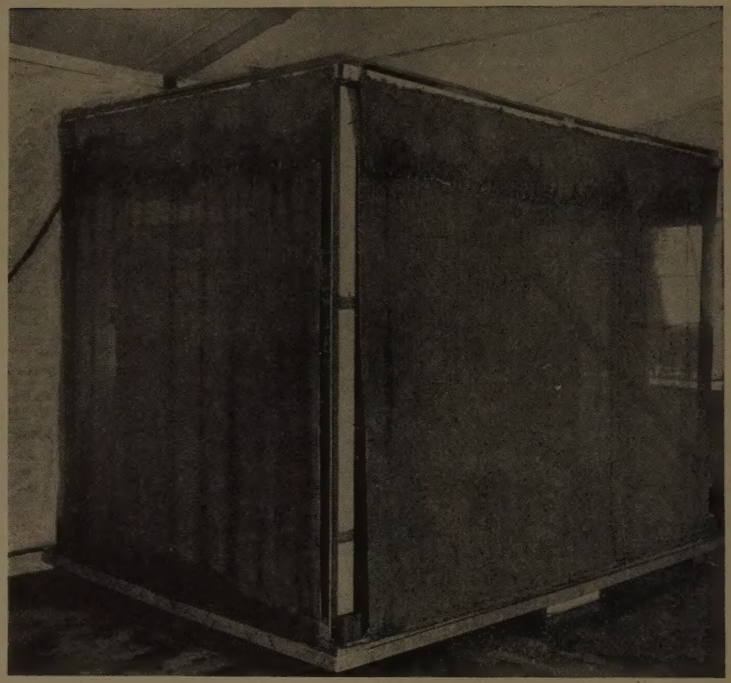
A first step in preserving egg quality is to move eggs from the laying houses to the egg store in a suitable container. This can be quite simple equipment. Eggs should be cooled as rapidly as possible after removal from the nest box, where during normal summer weather they are too hot. A bucket, kerosene tin, or any solid utensil holds this heat, whereas a wire basket allows dissipation of this heat.

A survey of the handling of eggs on farms was made by the Department last year. Of 56 producers in various parts of the Dominion 60 per cent. used wire baskets and 34 per cent. solid utensils such as galvanised buckets or kerosene tins. Two farms used both types and two farms collected with Keyes fillers.

Egg Stores

Many of the so-called egg stores on poultry farms are far from suitable for the holding of eggs before dispatch to an egg floor, and the ill effects of poor egg stores are accentuated because in many instances eggs are sent to egg floors only once a week.

Temperature and humidity are both important in the storage of eggs. Changes of temperature, particularly when high temperatures are reached, are most detrimental to the internal quality of eggs. High temperatures tend to break down the albumen, particularly the dense albumen surrounding the yolk.



The egg cooler, showing the hessian front drawn and water slowly permeating the hessian on all sides. The pipe from the tap leading to the top of the cooler and the pipe at the bottom leading from the galvanised metal trough to a drain can be seen at left.

When temperatures are high, such as after Christmas, eggs from birds which have been in lay for a considerable period are less resistant to heat and other detrimental effects than are eggs laid earlier in the season. Many eggs laid during the late part of a bird's laying year are what may be termed delicate eggs. They are of good quality when laid, but need more careful or efficient handling for marketing.

Many egg stores are unfit for the purpose to which they are put. Reports from two Poultry Instructors in widely separated areas contained the following remarks (1) ". . . in the great majority of cases the egg room is the last room to be thought of on a poultry farm. Eggs are stored and packed in any odd corner of some shed." (2) ". . . in general . . . egg store rooms on most [farms] are very poor buildings; in fact it appears that any room or shed that cannot be used for any other purpose becomes the egg-holding store. Unfortunately they are usually dirty and the standard of sanitation is very low."

On the 56 farms visited during the survey referred to earlier the egg rooms were reported on as follows: Good, 19 per cent.; reasonable, 38 per cent.; indifferent, 30 per cent.; bad, 18 per cent.

Almost half of the egg rooms had unlined galvanised iron roofs. A similar proportion had one window or more facing north and a quarter of them had windows facing west. In most instances the sun strikes such windows for an appreciable period of the day.

In 14 per cent. of the rooms direct sunlight was allowed to shine on the eggs.

The survey showed conclusively that many egg rooms need improvement.

An egg room should be a place specially set aside, and preferably specifically designed, for that purpose. The principal features of an egg room should be controlled temperature, reasonable humidity, and hygienic conditions.

Temperature

The main objective is to obtain a temperature as low as is practicable in summer and to avoid at all costs substantial fluctuations in each 24 hours. Temperatures between 60 degrees and 70 degrees F. are to be expected in summer, but figures of over 70 degrees F. and approaching 80 degrees can and should be avoided for the greater part of summer in most districts.

Humidity

Some confusion exists about humidity. Relatively high humidity in summer is desirable to prevent excessive evaporation in eggs and unduly enlarged air cells. Loss of moisture by evaporation can mean lower gradings, and enlarged air cells may give an impression of stale eggs. Where temperatures range between 60 and 70 degrees F. the desirable relative humidity is 75 to 80 per cent. Humidity is probably not as important as temperature, but should not be overlooked.

Hygienic Conditions

A good standard of hygiene in egg rooms is essential. Eggs should not be stored near strong-smelling materials, such as fish meal, kerosene, or onions, as they will readily absorb odours and become distasteful.

Design of Egg Rooms

When a new egg room is to be built the poultry keeper should give considerable thought to its design. Reasonable summer temperatures and avoidance of major fluctuations of temperature can be obtained only by the use of suitable construction such as hollow concrete block walls, cavity brick walls, or double-lined walls.

Roofing should be insulated by a false ceiling or by sarking. A cellar or building partly below ground level, where this is feasible, will give good temperature control. Windows should not be placed where sunlight strikes directly on the glass. Ventilation should be restricted to louvres or windows facing south. The floor should be of concrete so that it can be wetted to increase humidity when temperatures start to rise.

It is to be hoped that producers whose egg rooms or sheds can be improved without undue cost will consider carefully the advantages of making the necessary alterations. The sarking of unlined iron roofs or the altering of windows facing north does not involve a great deal of work.

Until producers show a better appreciation of the need for correct storage of eggs, produce will not be marketed in the best condition. Each producer has a responsibility in this matter and unless he will face it, measures will ultimately have to be taken to enforce satisfactory standards.

Value of Cooler or Coolgardie Safe

The New Zealand poultry keeper's reaction to the suggestion that eggs should be placed in a special cool room on the farm, as is done in some countries overseas, is nearly always that the cost of providing such storage is too great. Just before Christmas the Department constructed a cooler of the type known in Australia as the Coolgardie safe. Briefly, this cooler is a simple wooden rectangular frame with its sides or three of them covered with hessian or scrim, and with a light, solid top. Normally the top of the hessian on each side is steeped in water in a galvanised metal trough or guttering which goes round the top of the cooler. At the bottom the hessian hangs in a similar trough. The water slowly siphons down the hessian and keeps it wet, any surplus water going into the trough at the bottom.

The egg cooler with the hessian front rolled up. The full egg crates, empty egg crates, and wire baskets of eggs are all kept in this cooler.

The water container is replenished as required. The water on the hessian evaporates and this lowers the temperature within the cooler.

At the Department of Agriculture's Poultry Demonstration Plant at Upper Hutt one of these coolers was built to provide storage for 28 to 30 dozen egg crates and the number of wire baskets needed to hold a day's collection of eggs. Instead of a galvanised metal trough at the top this cooler has a length of plastic piping, round which the hessian is wrapped. The piping has been pierced with a number of fine holes at regular intervals. This piping is attached to a nearby tap, and when this is turned on gently water oozes out of the piping and trickles down the hessian. A metal trough at the bottom catches the surplus water and an overflow pipe takes it to a drain.

The framework of the cooler is about 8ft. wide, 6ft. deep, and 6ft. high, 3in. x 2in. timber being used. It has a wooden slatted floor raised 6in. off the concrete floor of the egg room. The trough round the bottom is 2in. deep and 3in. wide. A row of seven egg crates stacked four high occupies about half the floor area, leaving sufficient room for 8 to 10 baskets, which are held overnight before the eggs are packed next day. Each basket holds about 180 eggs or a half crate.

During mid-January, when fairly hot summer weather was experienced at the Poultry Demonstration Plant, temperature recordings supplied proof that a cooler of the type built was effective for holding eggs at reasonable temperatures. The egg room at the Poultry Demonstration Plant is a good one, being constructed of concrete with a false ceiling which largely eliminates radiation of heat from the roof; consequently the temperatures recorded in the egg room were not excessively high and did not show extreme fluctuations. In a less efficient egg room

the cooler could well show up to greater advantage.

Poultry keepers may not realise just how warm eggs get under natural conditions. The following are actual recordings of egg temperatures:—

	Time of day 10 a.m. deg. F.	Noon deg. F.	4 p.m. deg. F.
In the sun	105	105	98
In the shade	75	79	75
In a poultry farm ..	75	80	76
In an empty nest box	83	86	80

The temperature of eggs in a much-used nest box checked was 90 degrees.

Eggs were placed in iron buckets and wire baskets and some of these were put in an office which would approximate conditions in an average egg room and others in the cooler. Temperatures were as follows:—

EGGS IN OFFICE

	Time of day 5 p.m. deg. F.	7.30 p.m. deg. F.	11 p.m. deg. F.	8 a.m. deg. F.
Buckets ..	79	79	77	69
Baskets ..	79	79	76	65
Office temp.	73	75	71	64

EGGS IN COOLER

	Time of day 5 p.m. deg. F.	7.30 p.m. deg. F.	11 p.m. deg. F.	8 a.m. deg. F.
Buckets ..	79	78	76	65
Baskets ..	79	76	71	62
Cooler temp.	69	67	62	61

These figures illustrate that a cooler reduces the temperature of eggs to a lower figure than that reached by eggs retained in an ordinary building overnight, and further that eggs in baskets become cooler than those in buckets and cool quicker.

The next point is the effect of the cooler on eggs packed in 30-dozen crates. Keyes fillers placed in a wooden box act as insulating material, reducing either a rise or fall in temperature. For this reason packing of warm eggs straight from laying houses is considered most unsatisfactory, because the fillers tend to hold the heat and the eggs cool down slowly. Conversely, if eggs are cooled in wire baskets in a properly constructed cooler overnight and then packed into 30-dozen crates which have also stood in the cooler overnight, the eggs go into crates cool and the fillers and wood tend to insulate them from rising temperatures in the cooler or egg room during the day.

This is well illustrated by the following figures obtained by the Department when a check was made with two lots of eggs, one of which was held in an office representing average egg-room conditions and the other in the cooler:—

EGGS IN OFFICE

Thursday

	*6 p.m. deg. F.	7.30 p.m. deg. F.	10.30 p.m. deg. F.
Room temp.	75	72	69
Eggs in:			
Baskets ..	82	80	76
Buckets ..	82	82	80

* Eggs from laying house.

Friday

	8 a.m. deg. F.	†9 a.m. deg. F.	1 p.m. deg. F.	4 p.m. deg. F.
Room temp.	67	69	72	72
Eggs in:				
Baskets ..	66	66	66	67
Buckets ..	70	70	68	68

† Eggs packed in 2 30-dozen crates.

Saturday

	9.30 a.m. deg. F.	Noon deg. F.	4 p.m. deg. F.
Room temp.	67	72	73
Eggs in:			
Baskets ..	64	64	66
Buckets ..	64	64	66

EGGS IN COOLER

Thursday

	*6 p.m. deg. F.	7.30 p.m. deg. F.	10 p.m. deg. F.
Cooler temp.	65	64	64
Eggs in:			
Baskets ..	82	77	73
Buckets ..	82	82	80

* Eggs from laying house.

Friday

	8 a.m. deg. F.	†9 a.m. deg. F.	1 p.m. deg. F.	4 p.m. deg. F.
Cooler temp.	59	60	63	64
Eggs in:				
Baskets ..	60	60	60	60
Buckets ..	66	66	63	63

† Eggs packed in 2 30-dozen crates.

Saturday

	9.30 a.m. deg. F.	Noon deg. F.	4 p.m. deg. F.
Cooler temp.	59	63	63
Eggs in:			
Baskets ..	58	58	60
Buckets ..	59	59	60

Cost of Cooler

Sufficient data have now been given to indicate the value of a cooler of the type built at the Poultry Demonstration Plant. Such a cooler is also comparatively cheap, the cost for materials being £9 5s. (trough, £2 10s.; timber, £3; plastic piping, £1 10s.; hessian, £1 5s.; wood-pulp softboard top, £1).

Washing Eggs

Though the ideal is clean eggs not cleaned ones, on every farm there is likely to be a quota of soiled or dirty eggs. The number will vary with the time of year, breed kept, and the efficiency with which a farm is run. Obviously the bulk of these eggs have to be marketed, in most instances through an egg floor. The question is how can these eggs be handled with the least likelihood that they will deteriorate and cause trouble later.

Eggs clean on arrival at the egg room should never be washed, for two reasons: First, the pores of an eggshell are filled with an organic substance which normally makes the shell impervious to bacteria; washing and abrasive action tend to dissolve or remove this substance. Secondly, not only does washing remove this substance, but moisture aids bacterial invasion.

Lightly dirty and dirty eggs should be kept separate to reduce to a minimum the possible damage to the quality of the lightly soiled eggs. These may be cleaned with an abrasive material. Such eggs when cleaned are little damaged and are fit for general market purposes.

Only dirty eggs should be washed, and by immersion in water and a germicidal detergent. The eggs should be packed separately and marked, so that the egg floor can avoid using them as cartoned eggs. Though eggs that have been washed properly can be handled satisfactorily by an egg-floor distributor if he is warned that the eggs have been washed, eggs washed by improper and lax methods are always a potential menace to the market.

Proper washing involves the use of a germicidal detergent in water between 130 and 140 degrees F. Two short immersions (with a wire basket for the eggs and a tub or galvanised bin for the water) are needed, the first to loosen the dirt and the second to wash it off. The water should be changed frequently if many baskets of eggs have to be washed. All the eggs should be dried quickly and packed only when dry.

Faulty Washing

Eggs should never be washed in cold water or left to soak. Washing water should not be kept from one day to the next. Eggs should not be washed in machines that have tapes, brushes, and the like which are either difficult to sterilise or through carelessness are never sterilised.

Use of a little germicidal detergent does not make washing of eggs perfectly safe. It helps to protect the quality of the eggs, but is only a partially effective expedient because the eggs are dirty.

Any washed egg is a partially spoilt egg.

Dispatching from Farm

Forwarding eggs twice weekly from the farm is infinitely better than dispatch once a week. Leaving eggs out in the sun at the farm gate or elsewhere awaiting collection is bad. If the farm gate is far from the farm buildings and if there are other gates in between which the driver of the collection lorry or van must open, it may be desirable to stack the egg crates at the front gate. If this must be done, a small shelter should be erected at the gate to shade the egg crates or to keep them dry.

First-class Product

Eggs, just as much as other foods, will find an assured market only if a first-class product is maintained up to the stage at which it reaches the consumer. This article has attempted to show poultry keepers the extent of their responsibilities in marketing. Strict attention to the practices recommended would do much to encourage even greater sales of shell eggs.

WORK IN THE HOME GARDEN IN JUNE

By A. G. KENNELLY,
Horticultural Instructor, Department of Agriculture, Dunedin

GARDEN work in June usually consists largely of planning for the forthcoming season: Tidying and clearing away rubbish; digging if the soil is in a suitable condition and applying lime; turning the compost heap or burning unwanted diseased or woody rubbish which cannot be composted; and sorting over root crops in store. Garden tools can be cleaned and repaired, garden features made or rebuilt, paths, edges, and drainage improved, and where necessary spraying done against pests and diseases. Little sowing, planting, and maintenance of planted crops can be done.

THERE is always work to be done in a garden and though in most districts there is less sunlight and conditions are colder and damper in June than in any other month, the keen gardener can usually find plenty of work to do.

In wet weather garden tools should be sharpened and oiled or polished and where necessary repaired. It may be thought by the less-interested gardener that polishing garden tools is carrying enthusiasm for doing the job too far, but this is not so. A short time spent in removing rust and other residue that commonly adhere to garden tools and giving the working parts a smooth finish will be more than compensated for by the time and energy saved when they are used.

Soil or rust adhering to garden tools may make work more than twice as hard and often leads to inefficient garden practice. Soil adheres less readily to smooth, polished surfaces, and when it does it is more readily removed. All cutting edges should be very sharp unless the tools are to be used by children or those who cannot handle them competently, in which case cutting edges of tools such as hoes, spades, and shovels are better not filed down to the extent where they may be dangerous.

The intelligent choice and use of tools suited to the job is one of the most obvious though least practised forms of labour saving in the garden. For instance, heavy soils, particularly if they are inclined to be wet, can be dug with much less effort if a fork with clean, sharp tines is used instead of a spade. (Soil should not, of course, be dug when it is wet or the tilth may be destroyed.) Not every home gardener has a long-handled shovel, but a good one with a sharp, clean blade makes much garden work easier.

For surface cultivation, use of the best types of hoe is very important. A good push hoe should have a wide, sharp, clean blade set at such an angle that when the handle is held at a convenient working height the blade can be pushed along in the soil to cut weeds a little below the junctions of roots and stems. The blade of a chop hoe should be solid and sharp but not too wide, because then the work will be laborious if the soil is heavy or weeds are well established. Rakes are not much used in soil preparation by experienced gardeners, but a rake should be well balanced and have teeth of adequate length.

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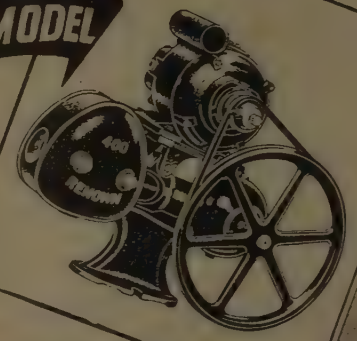

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Sowing and Planting

Conditions are not usually favourable for seed sowing in June, but where soil drainage and other conditions are satisfactory broad beans, spinach, and peas can be sown. The culture of these vegetables was discussed in last month's "Journal".

Cabbage for spring use can be set out in most districts and, where conditions are not likely to be too severe, lettuce and cauliflower as well. However, it is best in most gardens to defer sowing seeds of subjects such as carrots, onions, turnips, and even radish until July or later.

Garden Drains and Paths

Wet areas that are now showing up should be drained by field pipes or by open material such as shingle and stones buried in the bottom of a trench. Effective drains can also be made by digging a trench and putting material such as manuka scrub in the bottom or, if the texture of the soil is open enough, by putting boards in the form of a bottomless, open-ended box upside down. All such material should be buried deeply enough not to interfere with deep digging, and drains should not be so close to the surface that they cause the topsoil to dry out excessively in summer.

June is a good time, too, to repair paths. Temporary paths beaten across the soil can be forked up to improve surface drainage and destroy weeds, and permanent paths can be laid down. Usually paths made of hard-wearing material such as brick, stone, concrete, or even bitumin are preferable to grass. Grass is readily damaged in winter, when growth is slow, conditions are wet, and traffic is heavy, and in summer grass may dry out or require frequent cutting to prevent seed developing and falling on the garden.

Concrete and Brick Paths

Well-laid concrete paths of open-mixture concrete with plastered surfaces or paths of fine-mix concrete are unsurpassed for permanent use, but stone or cement slabs or old or new bricks can be made into attractive paths.

Used bricks can often be bought quite cheaply, but only those which were laid with mortar should be bought if the bricks are to be laid down according to a regular pattern, as bricks which have been cemented are too difficult to clean.

Bricks are suitable for straight paths, but are difficult to embody in curved paths. Brick paths, different types of

Paths or stepping stones are → especially appreciated by the housewife who harvests vegetables in wet weather.

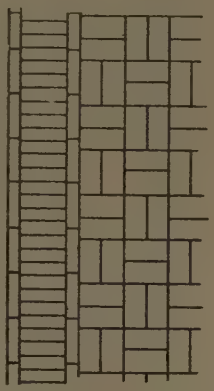

Fig. 1

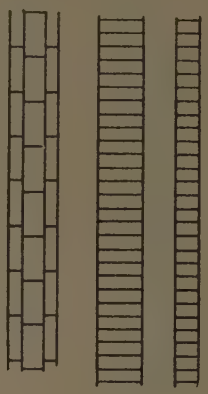

Fig. 1A

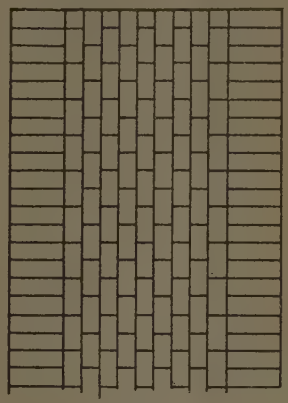

Fig. 2

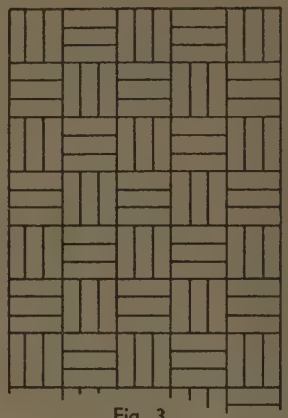

Fig. 3

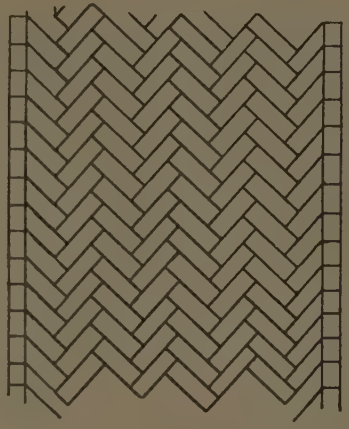

Fig. 4

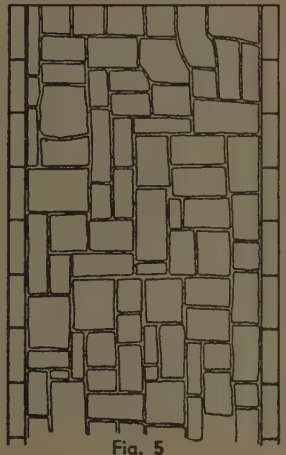

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

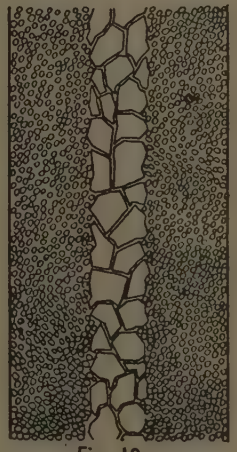

Fig. 10

Fig. 1—Brick path made in a square pattern with edging.

Fig. 1A—Types of edgings for brick paths. The two on the left are especially suitable for wide paths.

Fig. 2—Brick path of longitudinal pattern.

Fig. 3—Brick path of basket-weave pattern.

Fig. 4—Brick path of herring-bone or diagonal pattern.

Fig. 5—Random paving with formal edge.

Fig. 6—Random paving.

Fig. 7—Crazy paving.

Fig. 8—Paving slabs with connecting slabs.

Fig. 9—Paving slabs. Each slab should not be less than about 10in. wide or more than about 18in. wide.

Fig. 10—Cobble and stones or slabs.

which are shown in Figs. 1 to 4, are usually laid without cement or mortar. The bricks are simply packed tightly together and are held by outside pressure on the edges of the path. A firm foundation is essential to prevent them from shifting and it is usually advisable to have the surface of the path below that of the surrounding ground. The earth along the edges should be packed tightly to hold the mass of the bricks in place.

Alternatively an edge can be built by cementing the edging bricks. Edging bricks can be held very securely by pressure of earth if they are embedded deeply on their edges as shown in Fig. 11. The bricks will also be

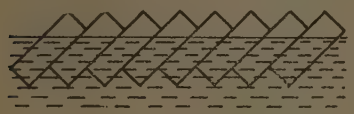

Fig. 11—An edging of bricks embedded on their edges.

held securely if edged with specially placed bricks (Fig. 1A) or with a brick, stone, or concrete wall.

The approximate number of bricks to lay down on a given area of path can be calculated (assuming that bricks 9in. x 4½in. x 3in. are used) on the basis that for each square yard of path about 32 to 34 bricks laid flat (that is, 9in. x 4½in.) will be required; 48 to 52 will be required if the bricks are laid on edge (that is, 9in. x 3in.).

Bitumin or Asphalt Paths

Though properly mixed, well-laid concrete gives the most durable paths, bitumin has advantages which appeal to many. Concreting is almost invariably heavy work and under some circumstances it may be quite costly. Bitumin paths are not usually cheap, but the laying of a bitumin path is usually less laborious and generally simpler than that of laying a concrete path, which usually requires more skill in levelling or smoothing, particularly as the work must be done quickly, as concrete is weakened if it is moved after it starts to set.

Bitumin gives a durable path which can be laid quite simply by most home gardeners. Bitumin is available in several forms in most of the larger towns. The solid type is usually sold sealed in 40-gallon drums, but as it must be melted before use, it is not so convenient for home gardeners, as it is usually difficult to provide a fire hot enough to keep it melted while working with it. This is a decided disadvantage if the work is done in stages as at week-ends.

Liquid bitumin is more convenient and is usually obtainable in containers down to 4 gallons. Liquid bitumin is ready for immediate cold application and hardens through the evaporation of a substance used to keep it liquefied.

Before bitumin is applied all perennial weeds must be removed by digging them out or by applying a good weedkiller at rates which will kill all vegetation and then removing the bulk of it. If this preliminary work is not done thoroughly, many strong-growing perennials are capable of thrusting up through the bitumin.

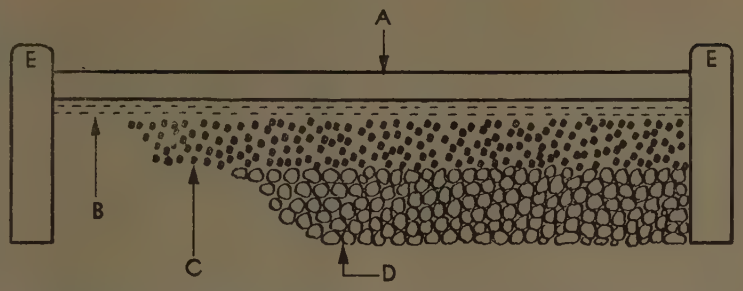

Fig. 12—Method of laying the foundation of a path. Each section must be well rammed. A—Slabs, bricks, crazy paving, or random paving. B—Fine material (sand, fine ash, etc.). C—Shingle. D—Larger stones. E—Edging walls.

A firm foundation is essential and where an established path is not being sealed with bitumin it should be formed first after the ground has been prepared by ramming in a suitable foundation material. The application of a grade of road metal comprised of a mixture of rotten rock, clay, and sand usually known as crusher-run metal, if packed firmly, gives a suitable first surface. A cubic yard of this material should provide a layer 1in. thick over 324 sq. ft. This thickness is usually enough for a footpath which does not have to bear heavy traffic.

Graded metal chips of not more than ¼in. diameter should then be laid down and rolled or tamped and watered. The path should preferably be slightly higher in the middle than at the sides. Bitumin can be applied with a watering can, preferably with a fan-shaped piece of tin wrapped round the spout so that as the bitumin flows it spreads out into a wide, flat stream. It should be poured on evenly so that it just floods up to the surface. A liberal sprinkling of clean, sharp sand should then be applied so that the bitumin is completely covered, but care should be taken not to get the dry sand on areas of metal not yet covered with bitumin.

The path should dry in one or two days, depending on the weather, and surplus sand can then be swept off. If only a light sprinkling of sand is applied, the path will have a rough surface, which is desirable on inclines.

On firm, established paths the crusher-run metal should not be needed and the usual practice is to remove weeds, dust, and loose metal, water thoroughly to settle it, allow it to dry, and then to apply bitumin and dust on the sand. Two applications may be needed. Alternatively in the larger towns it is usually possible to obtain a mix of bitumin and fine metal chips. This can be tamped or rammed into place and then sanded, though it is best if the ground, which must be firm and free from loose particles, is first given a dressing of tar or bitumin to act as a binder or key.

Crazy and Random Paving

For crazy paving, random paving, and random paving with a formal edge (Figs. 5 to 7) stones with flattened surfaces can be used, but cement slabs are preferable, as they are easier to lay. Unless the pieces are deeply embedded, they should be cemented together at the edges. However, it is a good plan if the edges are cemented to leave gaps in the interstices so that dwarf alpine plants or similar plants can be set into the spaces. (A list of suitable plants for this purpose is given on page 436.) Gaps will also aid drainage, as it is not usual to build this type of path with a camber unless it is wide enough for wheeled vehicles such as motor cars, though that width is not generally recommended.

Paving Slabs

Smooth concrete slabs or rough concrete slabs with plastered surfaces are most suitable for paving paths. The slabs should be at least 2in. to 3in. thick unless a solid foundation is provided. Paving slabs can be made quite simply by pouring concrete into wooden moulds or where the ground is firm enough by excavating areas required and filling them with a suitable concrete mixture and levelling or smoothing the surfaces. Concrete slabs can also be bought from some manufacturers of concrete products. Though most concrete is mixed on the job, in some towns it can be bought delivered ready mixed.

Stepping stones across grass or laid to give access to crops are usually well worth while if they are well laid. They can be made suitable for light wheeled traffic if narrow connecting blocks can be laid as shown in Fig. 8. If slabs vary in size, the larger and smaller ones should be laid alternately.

Usually slabs are best laid about 27in. apart, centre to centre, but the main governing factor in their spacing is their size. On grass they should be flush with the ground surface to facilitate mowing; on cultivated ground they should be a little higher.

If the slabs are not large, it is usually practicable to lift them from time to time to dig over the ground and eliminate perennial weeds and to re-lay them where they will provide access to crops such as brussels sprouts which may be harvested over a considerable period of inclement weather. On wet, sticky soil paving stones laid to give access to crops are usually greatly appreciated by the housewife.

Cobblestones and Concrete Paths

Large stones with flattened upper surfaces or cement or cement-surfaced concrete slabs can be used for the centre of paths made of a combination of cobbles and slabs or stones (Fig. 10). The cobblestones should be set in cement. Cobblestones are rounded, water-worn stones, and for paths they may be from about 1in. to 4in. in diameter. They are usually obtained from the seashore or a river-bed, though occasionally they may be procured from a gravel pit.

Path Foundations

Paths must have a firm foundation. The depth to be excavated may be from about 6in. to 18in. and will depend on the material to be used as a foundation, whether ashes, clinkers, shingle, or stone, and whether the soil on which the path is to be laid is firm or loose. A main path should usually be 4ft. wide; a secondary path which bears little traffic need be only about 2ft. wide.

The foundation should be rammed firm and the facing stone slabs or bricks bedded in fine material such as sand which can be packed tight and which will not shift or collapse. The depth of fine material should be kept to a minimum consistent with absorbing the irregularities of the surface material; that is, if rocks or slabs of uneven thickness are to be used, the fine material should be a shade deeper than the deepest rock or section of slab. Bricks rarely vary more than ½in. and therefore a little more than ½in. of fine material should be sufficient.

Organic matter, which may cause subsidence when it rots, must be avoided and air pockets eliminated. Fine material can usually be settled most effectively if watered. It should, however, be reasonably dry before the bricks or stones are embedded.

Care should be taken when paths are laid over drains, particularly when they have to take heavy traffic, to distribute the weight over a considerable area rather than to allow it to fall directly on the pipe or pipes under the path. This can be done by laying the pipes on a firm bed, covering them with a few inches of soil, and placing over this such material as an old sheet of corrugated iron, a plank dressed with preservative, or a few lengths of old electric conduit or other piping.

Tidiness is especially important in the garden in June.

Plants for Paved Paths

WHERE the soil is good and drainage is satisfactory a paved path can be greatly enhanced by planting suitable dwarf and miniature plants along the edges or in the interstices of the paving material. A selection of suitable plants (the measurements indicate height) follows:—

Acaena buchanani: Trailing, with silvery or blue-grey leaves.

Aubrietia: Purple and red flowers. 4in. to 6in.

Arabis lucida variegata: Golden foliage. 3in.

Armeria maritima and varieties: Rose, red, lilac, and white flowers. 6in. to 12in.

Campanula hewensis: Lilac-blue, starry flowers on 3in. stems.

Dryas octopetala: White flowers. 3in. to 5in.

Erinus alpinus and varieties: Forms a dark green carpet with rosy-purple flowers. 4in. to 6in.

Gypsophila cerastioides: Large, white, purple-veined flowers. 1in. to 3in.

Mentha requieni: Carpet plant with tiny lilac-purple flowers. 3in.

Potentilla nitida: Pale pink flowers. 4in.

Mossy saxifrage (*S. decipiens*).

Sedum album: 3in. to 6in.

Sempervivum montanum: Rosy red flowers. 4in.

Thymus herba-barona: Scented. 2in.

Thymus lanuginosus: Grey leaves. 5in.

Thymus serpyllum and varieties: Carpeting; flesh pink, crimson, or white flowers. 3in.

Veronica rupestris: Trailing; blue flowers.

Hydatid Disease: Dosing Dogs

By J. A. MILLER,
Livestock Instructor, Department of Agriculture, Blenheim

FOR many years the Departments of Agriculture and Health have drawn the attention of owners of dogs, particularly those owning dogs in rural areas, to the great importance of feeding these animals on hydatid-free material only and of dosing them at quarterly intervals with the arecoline hydrobromide pills which are issued when dogs are registered every year. Every dog which has access to raw offal and is not dosed to have tapeworms removed is dangerous to humans and stock. Dogs carry hydatid worms, the eggs of which infect man or beast with this dreaded disease. In spite of newspaper articles, radio broadcasts, and other appeals the disease is increasing, simply because dog owners will not:—

1. Ensure that dogs do not have access to raw offal.
2. Dose their dogs every 3 months with arecoline.
3. Bury the purged material.

THOUGH under the Meat Act the practice is illegal, many owners still feed raw livers and lungs to their dogs when sheep are killed on the farm, thus reinfecting them with hydatid tapeworms. Losses from hydatid disease are increasing. The most distressing aspect is the human suffering and death which ensue. Economic loss through the condemnation of exportable meat products, such as livers, is now estimated to amount to about £1½ million per annum. The incidence of the disease in humans and stock will increase if those who control dogs continue to neglect the simple procedures advised.

One of the factors which contribute to dog owners putting off the dosing "until tomorrow" is that most dogs do not swallow arecoline readily and dosing becomes difficult. However, if the dosing is carried out in the following manner, it will be found that the difficult animal can be dosed quite easily. The illustrations show each stage and should be followed carefully:—

1. Tie the dog to a fence on clear ground where purged material can be seen and buried later.

2. The dog must be taken out to the end of the chain and turned round facing the post to which it is tied. The chain must be tight so that the dog cannot get further back. The chain attached to the collar must be under the dog's throat and not behind the head.

HOGGET PROTECTION

IN many areas particularly where hoggets are wintered on root crops, losses from blackleg and malignant oedema are often experienced. Gum injuries, associated with the change of permanent teeth, favour the entry of organisms which cause these diseases, making sheep particularly susceptible at this time.

Vaccination of hoggets with TVL Blackleg or Combined Blackleg/ Malignant Oedema Vaccines before turning them on to winter feed will protect them against these diseases.

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3. The owner stands over the dog's back, with legs preventing the dog from moving sideways and his left hand on its chest to prevent it moving forward, so that with the chain tight it is fairly well fixed. The owner's right hand is placed under the dog's jaws, with the head held up and ready for dosing. However, the thumb must **not** be held over the dog's nose and its mouth closed, as a dog does **not** swallow well with the mouth closed.

4. The person giving the dose puts his right hand on the dog's head and grips the nose with thumb and fingers. A good thumb grip is required. The liquid is then placed in the open jaws.

5. The skin of the throat is taken in the left hand and pulled well out for 2 seconds, during which time the dog swallows. The right hand tilts the dog's head back at the same time. This instruction can be carried out in less time than it takes to read it, and a dog held in such a manner with the throat skin well pulled out must swallow.

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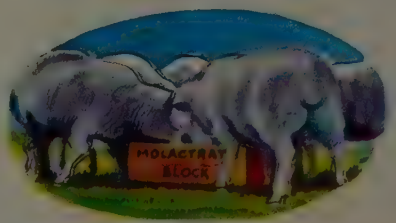

Dog held up to prevent vomiting.

Some dogs vomit when water is used and such dogs should be tried with tablets dissolved in glycerine instead of water. A dog can be prevented from vomiting by being held up for a second or two by the chain (see above). The dog should be held up smartly as it attempts to vomit and released smartly after the stomach contents return from the throat. If the first three attempts are checked, most dogs do not try again. The animal should not be held up for more than 5 seconds each time, as a dog chokes quickly.

A vicious dog can be dosed by placing a lasso of light rope over the upper and lower jaws and tightening it after a stick about 1in. in diameter has been placed crosswise in the mouth behind the tusks (as shown at right). If well tightened and tied, the lasso cannot be removed by the dog's front claws. It is always advisable to hold the front legs to prevent being scratched.

Dogs must be tied in a clear place for dosing, but should not be left out too long in the hot sun afterward and should not be worked hard immediately after dosing.

Dosage holders and piece of wire to grind down tablets so that they dissolve readily.

Container for Dosing

The metal dust cap from the air valve on an old model car wheel, or a piece of copper pipe corked at one end (above), is useful for holding the dose, as the dog cannot break it. The tablets should be placed in this container, slightly warm (**not hot**) water added to three-quarter fill it (about 1 tablespoon), and the tablets ground down with a piece of wire (above). If the dog does vomit in spite of efforts to prevent it, it may still purge overnight. If it does not purge in 24 hours, dose it again next day, watch it closely, and prevent vomiting. Alternatively, if the dog has vomited and has not purged in 2 hours after dosing, the dose can be repeated with half the original amount.

Dog's jaws tied to prevent biting during dosing.

Leading the dog round on the chain after dosing will help the arecoline to work.

Tablets given whole and dry or given in meat do not give as quick a purge as those dissolved in water, and purging may not take place until 2 or 3 hours after dosing. If the tablets are inserted in meat, the "doctoring" of the meat must be done out of sight of the dog.

Dose Rates

The dose rates for various types of dogs are:—

Farm collies: 4 months, ¾ tablet. 6 months, 1 tablet. 12 to 18 months, 1½ to 2 tablets according to the size of the dog. Over 18 months, 2 tablets or 3 for large dogs.

Terriers, spaniels: 1 or 2 tablets according to the size of the dog.

Great Danes: 3 to 4 tablets.

The lethal dose of arecoline hydrobromide is at least eight times the doses advised.

Finally, dog owners must not overlook the following points:—

1. Do not dose a dog that is sick.

2. Starve the dog for 24 hours before dosing. This means, as most dogs are fed once daily, that dosing is carried out shortly before feeding time, which can be delayed accordingly.

3. Dogs to be dosed must be rested beforehand. They must not be worked for at least 4 hours after purging has finished.

APPLE AND PEAR VARIETIES

Gravenstein

Granny Smith

Sturmer

Golden Delicious

Cox's Orange Pippin

Kidd's Orange Red

Ballarat

Rome Beauty

Delicious

Chief Commercial Varieties of Apples and Pears in New Zealand

By C. E. WOODHEAD,
Pip Fruit Specialist, Department of Agriculture, Palmerston North

NO fewer than 165 apple and 77 pear varieties are grown in New Zealand orchards today, according to a recent survey by the Department of Agriculture, the results of which were published in the November 1954 issue of the "Journal". Statistics show, however, that 15 varieties supply 94 per cent. of the apple crop, and a similar proportion of the pear output is contributed by only 9 varieties. With a few exceptions, mainly early culinary varieties which supply a limited market at the beginning of the season, the large number of minor varieties now grown could well be discarded, with considerable saving to the industry in costs of handling and marketing.

THIS article reviews the 24 varieties which provide the greater part of the New Zealand apple and pear crop, briefly recording their history and origin, where known, and giving a general background of their importance to producer and consumer.

APPLES

Gravenstein

An old German variety, Gravenstein is said to have originated in the garden of Grafenstein Castle, in Holstein, sometime in the 17th century. It is now much grown in Nova Scotia, Canada, from which large quantities are exported to England.

Average annual production in New Zealand is 109,000 cases, the variety being grown chiefly in Nelson (55,000 cases), Hawke's Bay (29,000), and Auckland (17,000). Gravenstein is the most important early variety grown in New Zealand. Harvested in January and February, it is valuable as an early cooker and also supplies the market with dessert apples until the Cox's Orange season. It is suitable for short cool storage only; up to 39,000 cases are exported annually to the United Kingdom.

Of excellent dessert and culinary quality, Gravenstein occupies a place on the local market which no other variety of the same season is qualified to fill. The fruit is medium to large, greenish yellow to orange yellow streaked with red, and the flesh is crisp and juicy with a rich, aromatic flavour.

Numerous types showing more colour have developed as bud sports from Gravenstein. Two of local origin now grown commercially are:—

Albany Beauty: This conspicuously striped form discovered in an Auckland orchard is equal in quality to Gravenstein, with the added advantage of development of colour earlier in the season. It is recommended by the Department of Agriculture as the best type of Gravenstein for commercial culture.

Oratia Beauty: This highly coloured bud sport from Albany Beauty, which is mottled and flushed with red all over, is inferior in quality to Gravenstein and Albany Beauty.

Cox's Orange Pippin

Raised in 1830 by a Mr. Cox at Colnbrook, near Slough, England, reputedly from a pip of Ribston Pippin, Cox's Orange Pippin was introduced to commerce in 1850. H. V. Taylor in his "Apples of England" (1936) says of this variety: "The superb flavour of the English-grown Cox suffices to rank it as the greatest apple of this age and the readiest seller in all markets".

Local average annual production is 221,000 cases, the chief centres being Nelson (113,000 cases) and Hawke's Bay (62,000). Cox's Orange Pippin is harvested in February and March and follows Gravenstein on the local market. Its cool storage life is approximately 10 weeks. A valuable export variety, it brings good prices in the United Kingdom, to which up to 126,000 cases are exported. Like its English counterpart, the New Zealand-grown Cox is one of the finest-flavoured dessert apples. Culinary qualities are also good, though Cox is seldom used for cooking.

The fruit is medium and yellow with red flush and broken stripes. The flesh is crisp, very juicy, and has a rich aromatic flavour.

Types showing more colour which are now grown commercially are Bledisloe Cox, a Gisborne bud sport with a crimson flush and heavy stripes, and Red Cox, a red bud sport discovered at Greenmeadows, near Hastings. Both types are reported to be inferior to standard Cox in keeping quality.

Kidd's Orange Red

Kidd's Orange Red is a dessert apple of good quality raised by the late Mr. J. H. Kidd, of Greytown, in the Wairarapa, from a cross between Cox's Orange Pippin and Delicious.

Average annual production is 39,000 cases, the variety being grown chiefly in Hawke's Bay (29,000 cases) and Auckland (6000).

It is harvested from February to March, immediately after Cox's Orange Pippin, and is suitable for short cool storage only. Up to 22,000 cases are exported. The fruit is medium to large and yellow with considerable red wash and stripes and the flesh is firm, juicy, and well flavoured.

Jonathan

Jonathan is an American variety discovered about 1828 on a farm at Kingston, New York, and named after Jonathan Hasbrouck, a local resident. It is said to be a seedling of Spitzenburgh. The variety is now grown extensively in Canada, the United States, Australia, and New Zealand.

Jonathan, with an average annual crop of 373,000 cases, ranks third in production among the varieties grown in New Zealand. It is an important commercial variety in all fruit growing districts from Hawke's Bay southward, but especially in Nelson (259,000 cases). The harvest period is March and April.

Jonathan has a cool storage life of approximately 3 months. Heavy exports are necessary to relieve the local market, up to 237,000 cases being sent to the United Kingdom and the Continent.

An important mid-season dessert apple on the local market, Jonathan is of good quality if harvested at the correct stage of maturity. The fruit is medium, with a bright red wash on the exposed surface and the remainder showing broken stripes on a pale yellow ground. The flesh is crisp and juicy and the flavour mild and good.

Statesman
Dougherty
Tasma
Jonathan
Frimley Beauty
Williams' Bon Chretien
Winter Nelis
Doyenne du Comice
P. Barry
Winter Cole

The Kapai Red Jonathan, a solid-red bud sport now in commercial production, was discovered in 1929 at Frimley, Hawke's Bay. It is reported to be inferior to Jonathan in keeping quality.

Delicious

Delicious originated in the garden of Jesse Hiatt, of Peru, Iowa, U.S.A., about 1880. It was introduced to commerce by the well-known nurserymen Stark brothers, of Missouri. It is now widely grown in North America and is a popular dessert apple on world markets.

With an average Dominion crop of 421,000 cases, Delicious is second to Sturmer in total production and is an important variety in all fruit growing districts, especially in Nelson (202,000 cases) and Hawke's Bay (98,000). The harvest season is March to April. A good keeper in cool store, Delicious supplies the local market until December. Delicious is also a valuable export variety, annual shipments ranging up to 235,000 cases. Owing to susceptibility to mouldy core, Auckland-grown Delicious are unsuitable for long storage or export.

The fruit is medium to large and yellow with extensive red wash and crimson stripes. The flesh is crisp and very juicy, and the flavour is mild. Delicious is a pleasant, good-quality dessert. Its low acidity makes it popular with those who dislike the brisk flavour of Cox's Orange or Sturmer, but is also the reason for the poor culinary quality of this variety.

Red bud sports of Delicious grown commercially in this country include Red Delicious (Law's) and Richared Delicious.

Red Delicious (Law's)

A red sport discovered about 30 years ago in the orchard of Mr. R. W. Law, at Hastings, Red Delicious (Law's) is the best red type of Delicious grown in New Zealand. It is equal to standard Delicious in quality and storage performance. Average annual production is 28,000 cases, of which 20,000 are grown in Hawke's Bay.

Richared Delicious: This red sport was found in a Washington, U.S.A. orchard and was introduced by an American nursery firm in 1926. It is equal to standard Delicious in quality, but is more susceptible to mouldy core.

Golden Delicious

A seedling discovered in West Virginia about 1890 and introduced in 1916 by Stark brothers, Golden Delicious was grown as a culinary apple until its excellent dessert qualities attracted attention. Golden Delicious is not related to Delicious.

Average annual production is 93,000 cases, the chief centres being Nelson (47,000 cases) and Hawke's Bay (26,000). Harvested in March and April, Golden Delicious is a good keeper in cool storage, supplying the local market until the end of August. It is also an export variety, up to 66,000 cases being shipped annually.

The fruit is medium to large and a clear yellow. The flesh is crisp, very juicy, mildly sub-acid, and of good flavour. This is a dessert and culinary apple of excellent quality and appearance.

Ballarat Seedling

Raised last century near Ballarat, Victoria, Ballarat Seedling was originally named Stewart's Seedling and is still known by this name in Australia.

Average annual production is 164,000 cases, of which 74,000 are grown in Hawke's Bay and 55,000 in Auckland. Concentration of the variety in the North Island has created a marketing problem in some years, which has been accentuated by competition with dessert varieties of similar season. Substantial export is necessary, therefore, and up to 66,000 cases are sent overseas each year.

Ballarat, the most important culinary apple grown in New Zealand, is harvested from late February to May. As it is a good keeper in ordinary (shed) storage, supplies are available on the local market until August. The fruit is large and green, turning to yellow when mature, with a red flush. Culinary quality is very good.

Statesman

Statesman was raised about the year 1870 at Malvern, Victoria, by a Mr. William Chandler, who obtained the seed from Tasmania. The variety was originally named Chandler's Seedling.

The average Dominion crop is 59,000 cases, with production fairly evenly distributed, Auckland and Hawke's Bay together accounting for 22,000 and Nelson and Otago for 34,000.

The harvest period is April to May. This apple keeps well in cool storage, supplying the local market until September. It is also a profitable export variety, up to 37,000 cases being shipped annually.

Of fair dessert quality and a good cooker, Statesman is a useful dual-purpose apple, keeping well in or out of cool storage. Fruit is medium to large and greenish yellow with extensive dull red wash and stripes. The flesh is crisp, juicy, and with a fairly good flavour. It is a well-coloured apple of attractive appearance.

Sturmer Pippin

The well-known Sturmer Pippin was raised in England by a Mr. Dillistone, a nurseryman at Sturmer, in Suffolk, and is reputed to be a seedling from Ribston Pippin pollinated by Nonpareil. It was probably introduced about 1843. Though little grown in England, Sturmer has become one of the leading varieties in the apple industries of Australia and New Zealand.

With an average annual total of 659,000 cases Sturmer accounts for 23 per cent. of New Zealand apple production and exceeds by 238,000 cases the production of Delicious, the next-ranking variety. Nelson (361,000 cases) and Hawke's Bay (174,000) supply the greater part of the crop.

Harvesting extends from April to May. Keeping for several months in cool storage, Sturmer is a valuable local market apple, as supplies are available up to December. As an export variety it is handicapped by lack of colour, but because of the heavy production large-scale export is necessary and up to 375,000 cases are sent overseas each year.

The Sturmer is noted for its flavour, long-keeping qualities, and general excellence as a dessert and culinary apple if harvested at the correct stage of maturity and promptly cool stored. The fruit is medium and greenish yellow with a bronze blush. The flesh is firm, crisp, and very juicy with a brisk, rich flavour.

Rome Beauty

Rome Beauty is an American variety which originated about 150 years ago as a seedling of unknown parentage planted in Ohio by a boy named Alanson Gilette. It was for some time known as the Gilette Apple, being later renamed after the town of Rome in Ohio.

Average annual production is 63,000 cases, the chief centres being Hawke's Bay (26,000 cases) and Auckland (12,000). It is harvested in April and May.

This variety keeps well in shed storage for at least 2 months and can be held in cool store until September. It is a local market and export variety, up to 20,000 cases being exported.

The fruit is large and greenish yellow with scarlet wash and crimson stripes. The flesh is crisp, juicy, and mild flavoured and dessert quality is only fair. Fruit is of attractive colour and shape.

Frimley Beauty

A red bud sport of Rome Beauty, Frimley Beauty was found on a tree in the home orchard of the late Mr. J. N. Williams's station at Frimley, Hawke's Bay. It was first propagated at Horton's Nurseries, Hastings.

Production (an average of 12,000 cases per year) is almost wholly confined to Hawke's Bay (5600 cases) and Auckland (5000). Harvest and storage periods are similar to those of Rome Beauty. Up to 4500 cases are exported.

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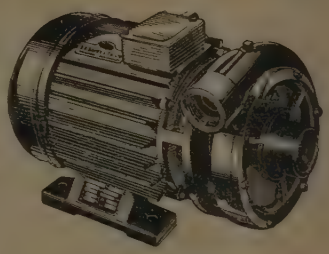

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In fruit characters it is similar to Rome Beauty, except in colour, being a solid, bright red to deep crimson.

Granny Smith

Granny Smith originated in Australia about 1850 as a chance seedling at the home of a Mrs. Thomas Smith, an English immigrant who settled with her husband and family at Ryde, New South Wales. The fine qualities of the fruit induced "Granny" Smith to plant an orchard with trees propagated from the seedling and it is recorded that the orchard was the sole support of her large family. The variety was later extensively propagated by nurserymen and today the Australian output of Granny Smith apples is as high as 250,000 cases a season, and large numbers of trees are not yet in bearing. Granny Smith is also grown extensively in South Africa.

With an average annual production of 255,000 cases Granny Smith takes fourth place among New Zealand apple varieties. Chief producing districts are Nelson (84,000 cases), Hawke's Bay (84,000), and Auckland (69,000). Harvesting extends from April to May. A long-term cool storage variety, Granny Smith supplies local markets until October. In addition it is a popular apple on the United Kingdom market and up to 76,000 cases are exported annually from New Zealand.

The fruit is large and green to yellowish green. The flesh is crisp, very juicy, and mildly flavoured. Though not a highly flavoured apple, Granny Smith is a valuable late dessert and culinary variety.

Tasma

Tasma is a variety of Tasmanian origin, extensively grown in that State under the name of Democrat.

Average annual production is 13,000 cases, of which 8000 are produced in Nelson and 3000 in Central Otago.

The harvest season is April and May. It will keep in ordinary storage for 3 months and in cool storage up to December. It is therefore a useful end-of-season variety for local marketing and, being a red apple, is also suitable for export. Up to 8000 cases are sent to overseas markets.

Fruit is medium, the colour solid red, and the flesh firm, juicy, and mild flavoured. Dessert quality is only fair, the chief merit of the variety being associated with its colour and keeping qualities.

Dougherty

The origin of Dougherty is uncertain, but possibly it is American, as a variety of this name was listed but not described in a report published by the Indiana Horticultural Society in 1890.

Average annual production is 107,000 cases, the variety being grown chiefly in Hawke's Bay (55,000 cases), Nelson (27,000), and Auckland (19,000). It is harvested from April to early June. Dougherty will keep in ordinary storage for 3 months and in cool storage to the end of November. It is of value chiefly for export, up to 90,000 cases being shipped overseas each year.

The fruit is small to medium and greenish yellow largely overspread with solid red. The flesh is firm, not very juicy, and mild flavoured. A late, red dessert apple of mediocre quality, Dougherty is of value for export and long storage.

PEARS

Williams' Bon Chretien

Williams' Bon Chretien was raised about 1770 at Aldermaston, Berkshire, by a schoolmaster named Stair and was first propagated by Mr. Williams, a Middlesex nurseryman, from whom it received its name. Shortly after the variety was introduced to America (in 1799) the name was lost and under the name of Bartlett the variety has achieved fame as the popular canning pear of North America.

With an average annual production of 109,000 cases Williams' Bon Chretien is the leading New Zealand variety. Recent heavy plantings indicate an increase in production of up to 50 per cent. in the next 10 years. Because of present difficulties associated with local marketing of this poor-keeping variety further planting should be viewed with caution.

The main centres of production are Hawke's Bay (50,000 cases) and Nelson (37,000). The variety is harvested from late January to February. The favourite canning, bottling, and summer dessert pear in New Zealand, Bon Chretien has poor keeping qualities and immediate disposal of the crop for dessert or canning is necessary.

The fruit is large and yellow and the flesh fine grained, melting, juicy, and richly flavoured.

Louise Bonne de Jersey

Louise Bonne de Jersey was raised in Normandy, France, about 1788 by a M. Longueval.

Of the average annual production of 18,000 cases, 16,000 are grown in Hawke's Bay. The harvest season is February to March. It is a short-term local market and export variety. At present few pears are exported from this country.

Fruit is medium and pale green to yellow with a dull red blush. The flesh is melting, juicy, and with a rich flavour. It is an attractively coloured dessert pear of good quality.

Packham's Triumph

Packham's Triumph was raised in 1900 by a Mr. Packham, of Molong, New South Wales. Today there are 100,000 trees of the variety in that State, where it has become the most popular pear.

Production averages 15,000 cases annually, the chief centres being Auckland (6000 cases) and Hawke's Bay (5000). Harvested in February and March, this variety matures a week or two later than Louise Bonne de Jersey. It is a short-term cool storage and export variety. Packham's Triumph is a dessert pear of excellent quality and is also popular with the public for bottling. A much better keeper than Williams' Bon Chretien, it merits more extensive cultivation as a dual-purpose pear.

The fruit is large and yellow and the flesh melting, very juicy, and of a delicious flavour. The only defects of the fruit are a somewhat uneven surface and the development of a pink tint in the flesh when bottled or canned.

Beurre Bosc

A Belgian variety, Beurre Bosc was raised in 1807 by Dr. Van Mons, of Louvain.

Average annual production is 16,000 cases, main supplies coming from Nelson (9000 cases) and Auckland (4000). The variety is harvested from late February to March, maturing a few days after Packham's Triumph. It is suitable for short cool storage and export.

Beurre Bosc is a russet dessert pear of high quality and good appearance. The fruit is large and almost wholly covered with smooth cinnamon russet. The flesh is melting, very juicy, and of rich flavour.

Doyenne du Comice

Raised at Angers, France, about 1840 by the Horticultural Society of Maine and Loire, Doyenne du Comice was introduced into England in 1858. Average annual production is only 4500 cases, of which half are grown in Hawke's Bay.

The harvest season is February to March. This pear is suitable for short cool storage and export. It is distinguished by its large size, handsome appearance, and superb quality, but a well-founded reputation for poor cropping has restricted planting of this dessert pear.

The large fruit is greenish yellow to yellow. The flesh is fine grained, melting, very juicy, aromatic, and richly flavoured.

Winter Cole

Winter Cole, a seedling of Winter Nelis, was raised in Victoria by a Mr. J. C. Cole some time in the last century.

With an average crop of 105,000 cases, Winter Cole is second to Williams' Bon

Chretien in production. It is extensively grown in Hawke's Bay (50,000 cases) and Nelson (42,000). Harvested in March, Winter Cole is a most valuable late dessert pear for long cool storage and supplies the local market until December. It is also suitable for export.

The fruit is medium and yellowish green and mostly overspread with russet. The flesh is melting and very juicy with a sweet, rich flavour—a high-quality dessert pear.

P. Barry

P. Barry is an American pear, raised in 1873 from a pip of Belle Lucrative by Mr. B. S. Fox, of San Jose, California, and named after the famous American nurseryman and pomologist Patrick Barry.

Annual production averages 24,000 cases, of which Hawke's Bay supplies 13,000 and Auckland and Nelson 4500 each. Harvested from March to April, P. Barry is noted chiefly for its excellent keeping qualities in shed or cool storage. It supplies the local market until the end of the year. The variety is marketed in this country chiefly as a culinary pear.

The fruit is large and deep yellow mostly overspread with russet. The flesh is of medium dessert quality but good culinary quality.

Kieffer's Hybrid

Kieffer's Hybrid originated about 1863 in the nursery of Peter Kieffer, at Roxborough, near Philadelphia, U.S.A., as a seedling of the Chinese Sand pear probably pollinated by Bartlett (Williams' Bon Chretien). Kieffer is now one of the two leading canning varieties of North America, sharing this distinction with Bartlett.

Average annual producion is 16,000 cases, almost all from Auckland (10,000 cases) and Nelson (4700).

The harvest period is March to April. Kieffer's Hybrid has poor dessert quality, but is a good culinary and bottling pear, retaining its shape and whiteness of flesh when canned. It is marketed in New Zealand only.

The fruit is medium to large and golden yellow. The flesh is coarse and granular and juicy, but of culinary quality only. The clear, golden yellow colouring and unusual shape make this pear quite distinctive.

Winter Nelis

Raised in Belgium early last century by M. Nelis, of Malines, Winter Nelis was introduced to England in 1818.

With an average crop of 65,000 cases Winter Nelis ranks third in production. Almost two-thirds of the crop is grown in Hawke's Bay (41,000 cases), next in importance being Central Otago (11,000) and Nelson (10,000). The harvest season is March and April. This variety is an important long-storage dessert pear for local marketing, supplies lasting until December. It is also a good export variety.

The fruit is medium and yellowish green mostly covered with russet. The flesh is melting, very juicy, and of rich flavour. It is a high-quality dessert pear.

☆

Radio Broadcasts for Farmers

RADIO broadcasts for farmers during June are as follows:—

1YA Auckland, 7.45 p.m.

5 and 19 June—Talks by officers of Animal Industry Division, Department of Agriculture, Auckland.

12 June—"Winter Feeding of Stock", by C. M. Blick, Fields Instructor, Department of Agriculture, Warkworth.

26 June—"Nitrogen Topdressing", by G. B. Haddow, Instructor in Agriculture, Department of Agriculture, Auckland.

1XH Hamilton, 12.33 p.m.

10 June—"National Publicity Week for Young Farmers' Clubs", by J. R. Mitchell, Cambridge Y.F.C.

17 June—"Bovine Tuberculosis", by D. W. Caldwell,, Veterinarian, Department of Agriculture, Hamilton.

24 June—"Federated Farmers for Protection and Service", by M. Boyce, Federated Farmers, Hamilton.

1YZ Rotorua, 7.15 p.m.

12 June—"Fertilisers Need to be Well Balanced", by B. M. Piper, Horticultural Instructor, Department of Agriculture, Palmerston North.

26 June—"Some Aspects of Sheep Farming", by A. G. W. Stevens, Livestock Instructor, Department of Agriculture, Rotorua.

2XA Wanganui, 8 p.m.

6 June—"For the Country Woman", by Mary MacDonald.

13 June—"The Radio Vet.", by S. Jamieson, Veterinarian, Department of Agriculture, Wanganui.

20 June—"Seasonal Livestock Notes", by J. F. Munting, Livestock Instructor, Department of Agriculture, Wanganui.

27 June—"Popular Potato Varieties", by G. R. Moss, Fields Instructor, Department of Agriculture, Wanganui.

2XG Gisborne, 8 p.m.

4 June—"Stockowners' Question Time", by E. B. Smythe. Livestock Instructor, Department of Agriculture, Gisborne.

2YZ Napier, 7.10 p.m.

4 June—"Results of Field and Crop Trials", by A. J. Coughlan, Fields Instructor, Department of Agriculture, Hastings.

18 June—"Summary of Papers to be Given at National Weeds Conference, Napier", by F. H. Collin, Fields Instructor, Department of Agriculture, Hastings.

2ZA Palmerston North, 12.33 p.m.

10 June—"Pasture Establishment in Spring", by L. W. Blackmore, Instructor in Agriculture, Department of Agriculture, Dannevirke.

17 June—"Some Recently Introduced Spray Materials", by G. N. Paulin, Horticultural Inspector, Department of Agriculture, Palmerston North.

24 June—"Farm Water Supplies", by J. O. Brasell, Farm Machinery Instructor, Department of Agriculture, Palmerston North.

3YA Christchurch, 12.20 p.m.

17 June—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Instructor in Agriculture, Department of Agriculture, Rangiora.

4YA Dunedin and 4YZ Invercargill, 12.33 p.m.

5 June—"The Study of Climate for the Better Use of Pastures", by Dr. K. J. Mitchell, Department of Scientific and Industrial Research, Palmerston North.

10 June—"The Value of the Y.F.C. Movement", by J. R. Thomson, Instructor in Agriculture, Department of Agriculture, Invercargill.

17 June—"Feeding the Ewe Flock", by A. J. Langford, Livestock Instructor, Department of Agriculture, Balclutha.

24 June—"Weed Control in the Home and Market Garden", by A. G. Kennelly, Horticultural Instructor, Department of Agriculture, Dunedin.

4YZ Invercargill (following joint programme from 4YA and 4YZ)

10 June—"Soil Moisture", by I. R. Falconer, Drainage Advisory Officer, Department of Agriculture, Invercargill.

17 June—"Diseases of Rams", by R. Buchanan, Livestock Instructor, Department of Agriculture, Gore.

24 June—"Meat Inspection", by H. Cato, Supervising Meat Inspector, Ocean Beach.

Regular Sessions

1XH Hamilton, Mondays at 12.33 p.m. and Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

1XN Whangarei, Mondays at 8 p.m. (Northland livestock report and "Farming for Profit"), Wednesdays at 8 p.m. ("Farming for Profit"), and Fridays at 8 p.m. ("News for the Farmer").

1YA Auckland, Mondays at 12.33 p.m., Tuesdays, Wednesdays, and Thursdays at 7.45 p.m., and Fridays at 6 p.m. and 7.45 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock market review), Tuesdays at 7 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m. (Pig Council talk on fourth Wednesday of every other month), Thursdays at 12.33 p.m. and 7.15 p.m. (fortnightly).

2XA Wanganui, Wednesdays at 8 p.m., (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8.1 p.m.

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

2YZ Napier, Tuesdays at 12.12 p.m. (Hawke's Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawke's Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Mondays at 8 p.m. (Pleasant Point stock market report), Tuesdays (fortnightly) at 8 p.m. (Temuka stock market report), Wednesdays at 8 p.m., and Saturdays at 10.30 a.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

3YZ Greymouth, Mondays and Thursdays at 12.33 p.m.

4YA Dunedin, Tuesdays at 12.33 p.m., Wednesdays at 7 p.m. (Burnside stock market report), Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m., Tuesdays at 7 p.m.

Efficient Use of Artificial Heat in Farrowing Houses

THOUGH the Ruakura round farrowing house has established itself in practice as a design which will minimise losses from overlying in pig litters, progress is still being made in details of design and construction to conserve heat in the central zone. A development which increases the efficiency of artificial heat as an aid to the reduction of losses is described in this article by A. Longwill, Superintendent, Pig Industry, Department of Agriculture, Wellington.

THE observation that artificial heat was a potent factor in reducing farrowing losses led to the incorporation of the warmed zone in the nearly central position in the farrowing house designed by the Ruakura team of workers.

In this design much stress was laid on keeping down the total air space of the house to enable the heat generated by the sow and litter, plus that from the artificial source, to maintain temperatures in the whole house as near as practicable to those suitable for baby pigs. A temperature of 75 degrees F. is aimed at, but in most houses built hitherto this heat is continually being dissipated to the outer parts of the house occupied by the sow. There is no evidence that she secures any practical advantage from the slight rise in air temperature which takes place in this part of the house and this has led to a re-appraisal of the design with the objects of:—

(a) Reducing the power costs of artificial heat.

(b) Removing difficulties of access for cleaning out in some earlier designs of the round house.

(c) Enabling the young pigs to keep themselves warm without the need for artificial heat after the first week, thus promoting their powers of adjusting body temperature to their normal environment.

(d) The conversion of older, permanent types of farrowing houses with larger air space to farrowing houses of the round house plan.

Recording instruments, a globe thermometer and thermograph, in position in the safety zone of the house. A 400-watt dull emitter lamp is suspended over the zone.

The cover which was provided for the safety zone. This is lined with aluminium foil and on it is mounted with insulators a 100-watt heating panel. A 15-watt pilot light is mounted alongside the panel.

Conversion of Old House

The trials on which the conclusions stated in this article are based were carried out to determine an efficient method of converting a range of old brick-and-plaster farrowing units to the round house plan. At the outset it was observed that the temperature in the house varied with the outside temperature, never being more than 5 or 6 degrees different from this, as ventilation under the roof was unrestricted, there being no cover boards between the rafters.

No attempt was made to improve this aspect of the design at the start, as it was realised that the conditions existing would enable a study to be

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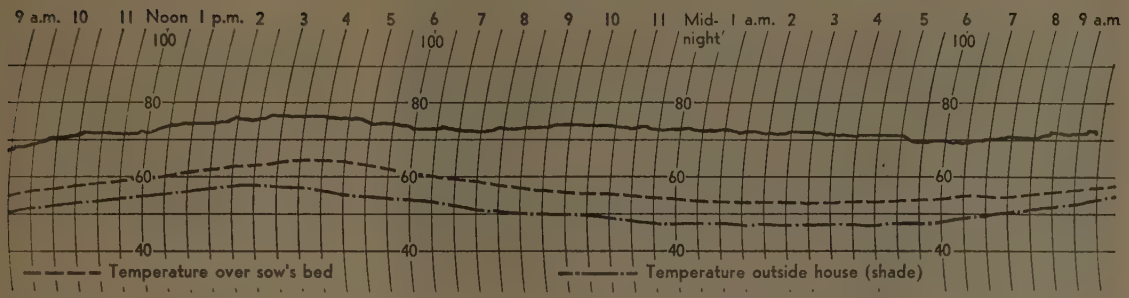
USE OF ARTIFICIAL HEAT IN FARROWING HOUSES


9 a.m. 10 11 Noon 1 p.m. 2 3 4 5 6 7 8 9 10 11 Mid-night 1 a.m. 2 3 4 5 6 7 8 9 a.m
100
80
60
40
Temperature over sow's bed
Temperature outside house (shade)

The upper line on the graph is a thermograph record of temperature throughout a day in the safety zone with a 100-watt heating panel 18in. above the bed. The air temperatures at the sow's bed and outside the house are shown for comparison.

made of the effect of developing the design to provide two climates within the one house—one for the litter in the warm zone with temperatures of 70 to 75 degrees F. and one for the sow at virtually normal air temperature, varying more widely through the day and from day to day.

Heat Sources Used

A variety of heat lamps was tried, special attention being given to dull emitter types in an endeavour to secure maximum heating from the power used. Pilot lights were used to provide enough light to attract the young pigs into the safety zone.

In July, when outside temperatures varied from a minimum of 34 degrees to a maximum of 58 degrees a 400-watt lamp of the dull emitter type was required to maintain the safety zone temperature at a fairly uniform level, 68 to 74 degrees F. This result was obtained with the standard, half-round, 3ft.-diameter baffle and guard rails with the lamp suspended 16in. above the bed.

It was decided to experiment with lower power heat sources, using various methods of conserving heat. As a first step a galvanised iron cover in the shape of a low cone with a 3in. vertical lip was built, and a 250-watt panel element and 15-watt pilot light were installed in the cover, which was suspended over the safety zone by a three-point light chain suspension from the roof. At a height of 15in. above the bed this element gave the desired temperatures and a better spread of heat than the conventional dull emitter type of element.

Conservation of Heat

The use of a cover over the central zone indicated the possibilities of economising on power if an effort were made to design the zone to conserve heat rather than to dissipate it, as is done in most houses of the type built hitherto. The next step taken, therefore, was to line the whole of the zone with aluminium foil, leaving only the 10in. deep opening under the lower guard rail uncovered. The result was remarkable, a rise of 10 degrees in temperature taking place within 5 minutes of the lining being placed in position.

This enabled a further reduction in wattage of the element used. A 100-watt heating panel with a 15-watt pilot light 18in. above the bed was found to give almost perfect conditions with a gentle, uniformly spread heat which encouraged the pigs to spread over the floor of the zone and not cluster together.

After the pigs were 14 days old the heat was switched off during the day. The pigs maintained the temperature at 75 degrees F., which was 10 to 12 degrees above that over the sow's bed and 10 degrees above the maximum outside shade temperature that day. With the element switched on from 5 p.m. until 8 a.m. the zone temperature throughout the day was maintained relatively uniform, being 72 degrees F., or 31 degrees higher than the outside minimum temperature, and 78 degrees F., or 10 degrees higher than the outside maximum during the afternoon, when no artificial heat was being supplied. The element was 18in. above the bed at this stage, and it is obvious that raising or lowering the cover would hold the temperature required under varying external temperature conditions.

Conservation of heat in the enclosed safety zone is also effected by eliminating excessive ventilation. Observations taken on a day when a wind of moderate force was blowing showed that whereas the air velocity was 215ft. per minute outside, 155ft. per minute in the open doorway of the house, and 45ft. per minute over the sow's bed, it was only 15ft. per minute in the zone area with the element on and 13ft. per minute when it was switched off.

This, while providing sufficient ventilation for comfort, eliminated any undesirable draughts round the small pigs. The conditions of comfort were

A vigorous litter of 12 pigs reared in the converted farrowing unit.

A general interior view of one unit of a permanent multi-unit farrowing house which has been converted to the round farrowing house plan. The photograph was taken before the central zone was closed in.

such that the pigs showed an invariable preference for the safety zone. This was achieved without the undesirable side effects of enervation which have been noted where pigs lie for a long time directly under a higher-powered heat lamp. When out in the cooler air these pigs were vigorous and playful.

Design of Baffle Recommended

As a result of these trials it is recommended that the design of the central zone of the round house plan, whether in a new house or one converted from the conventional square or oblong farrowing house, should allow for the possibility of creating two different climates in the farrowing house and, more specifically, provide conditions which will enable the temperature in the central zone to be maintained at over 70 degrees F. even when outside temperatures fall to freezing point.

It appears at present that the essentials in such a safety zone design will be:—

(a) The baffle should be built with a full circle and solid walls with a 10in.-high creep space left open on the inner half. The over-all height of the baffle need be no more than 30in. if the following recommendations are adhered to and the house is so constructed that driving rain will not enter the top of the baffle.

A kerosene heat lamp which may be used if no electric power is available at the piggery.

(b) A cover of low cone shape should be provided for the zone. It should be built from a simple, flat sheet of galvanised iron or hardboard, mount a heating-panel-type element, and be suspended by a chain so that it may be readily raised or lowered and removed for cleaning the bed. The electrical connection must be approved by the local power board. There should be a three-point plug on the ceiling with a sufficiently short flex so that if the suspension chain breaks the plug is automatically pulled out.

(c) Cover and baffle walls should be lined with aluminium foil. Though the foil used in the trials was placed between doubled 1in.-mesh wire netting and stapled to battens, thus permitting a 1in. air space behind the foil, it is felt that efficiency would still be high if the foil were fixed to the walls of the baffle with an adhesive. For this purpose single-sided, paper-backed foil would be the most economical.

Makers of some prefabricated types of round houses have been informed of the conclusions drawn from these trials and have already produced designs which promise success.

Influence on Round House Design

The effort to reduce the air space in a round house to about 160 cub. ft. while permitting access for cleaning and where necessary for attention to the sow or litter, has resulted in a variety of designs each with a movable lid-type roof. These houses tend to be expensive if well insulated, as they must be if heat is to be retained. They are subject to wear and tear and are difficult to make completely waterproof.

Completely precast igloo-type designs are available which, though still retaining the optimum air space, allow access through a front door with about 5ft. 6in. clearance. As these houses are precast for delivery to farms by truck, however, insulating qualities in the concrete must be sacrificed to the need for structural strength.

It will always be wise to reduce the house size to the nearest optimum air space consistent with ease of management. These factors will have to be considered with those of annual cost over the life of the building and of efficiency in stabilising the temperature under the large daily fluctuations common in New Zealand. Ease of management will become the paramount consideration, however, if the principle of a two-climate house becomes accepted. This is logical where, as in New Zealand, labour looms so large in the cost of production.

This will give scope for the multi-unit type of farrowing house for larger, specialised pig farms. On a smaller farm the ability of the farmer to build a suitable house himself may be the determining factor in whether or not a round farrowing house is used, and there seems to be no reason why a house with easy access and a permanent, well-insulated roof cannot be built for little extra cost compared with the cost of lower, less convenient, or less well-insulated types of houses at present being built.

The Home Orchard in Winter

THERE are both interesting and necessary tasks for the home orchardist in winter, and they can be given the time they deserve, as there is normally less to do in other parts of the garden at this time. Notes on routine work are given in this article by S. P. Money, Instructor in Horticulture, Department of Agriculture, Wellington, as well as advice on planting and pruning citrus trees and grape vines.

[*Sparrow*

This heap of prunings thrown carelessly in a corner of the orchard may contain fungous disease and is a real source of danger.

TO control scale insects, woolly aphids, and red mite winter oil should be applied to all deciduous fruit trees and berry fruit plants other than strawberries while they are dormant. Full dormancy is essential, as this spray kills by its ability to smother the insects for a long period.

The oil and water emulsion which is formed puts a fine film of oil over the trees and plants that persists for 3 weeks or more. While dormant, plants easily withstand this treatment, but severe damage can be caused if plants have started to grow when the spray is applied, as at this time the leaves require large amounts of air. Red oil should be applied at a strength of 2 pints of oil to 4 gallons of water.

All prunings in the orchard should be collected and destroyed by burning as soon as pruning is finished. This is especially important where there have been pests such as red spider, woolly aphids, and scale insects or diseases such as brown rot. As eggs or spores carry over winter, digging beneath the trees to turn in leaves and brown rot mummies is important to orchard hygiene. Brown rot mummies left on the trees must be picked and buried deeply.

Mummified fruits overwinter brown rot (*Sclerotinia fructicola*). In spring a small mushroom-shaped spore carrier emerges from the fruit and discharges large numbers of spores which infect the new shoots and flowers.

Where trees are growing on lawns it is important that any fruit which has fallen from the trees earlier in the season should be collected and either buried or burnt, as much of it will be diseased. Raking up the autumn leaves and burning them promptly also assists in reducing pests and diseases.

Care of Equipment

After pruning is finished and winter sprays have been applied a little time should be spent on maintenance of equipment. Sprayers, especially the knapsack type, should be washed out with warm soapy water and have clean water pumped through them. Pruning tools such as saws, secateurs, and knives should be rubbed clean with an abrasive and oiled before being put away.

Citrus

Citrus trees usually are received from the nursery in late autumn or winter, but they can be planted in any of the rainy months (April to September). Where there is risk of frost planting should be delayed to August or September.

Holes for citrus trees (2ft. wide and 18in. deep) should be dug a few weeks before planting and exposed to the sun and air. The topsoil should be kept in a separate heap and not mixed with the subsoil. Organic matter such as compost may be placed at the bottom of each hole.

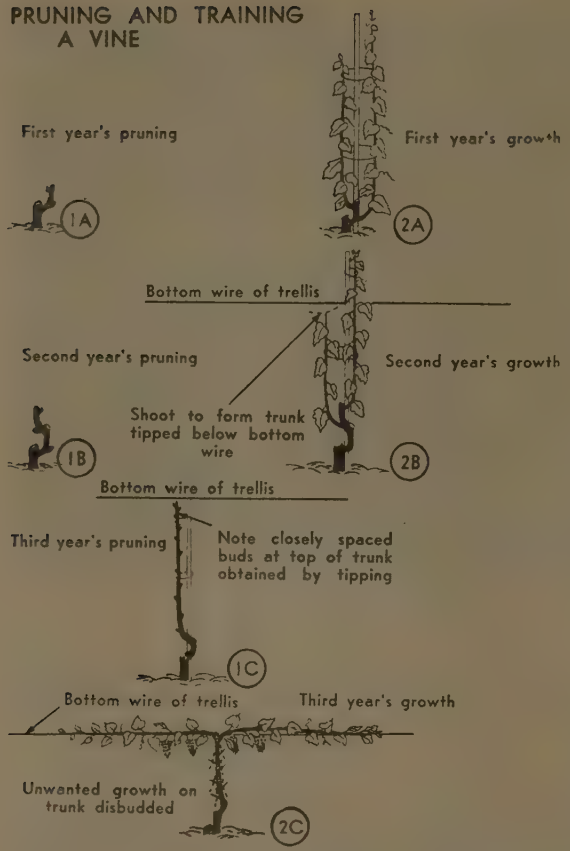
Before the tree is placed in the hole it should be inspected and all damaged or malformed roots removed. A cone of topsoil is formed in the hole and firmed so that the apex of the cone reaches 4in. below ground level. The tree should then be set on the cone and planted at the same level as it was in the nursery. This is shown by the soil mark on the trunk.

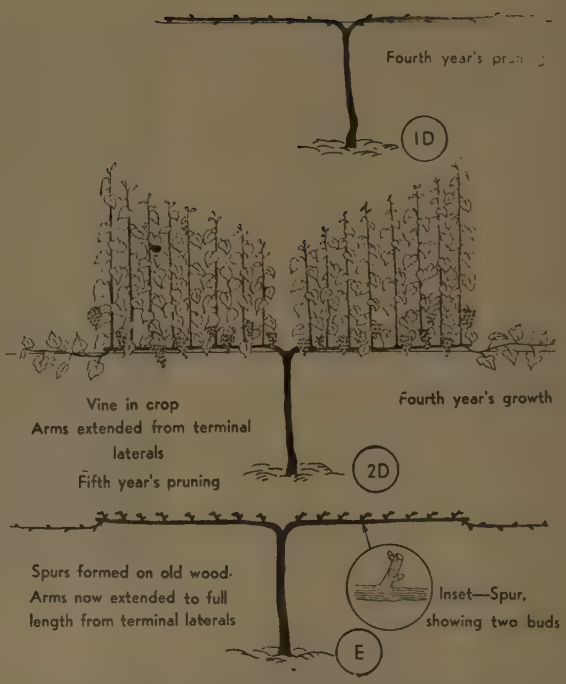
Two people can best do the planting; one person to hold the tree in position and the other to spread out the fine roots and cover them with topsoil. The work should be done carefully so that as few roots as possible are injured. Only topsoil should be used. If there is insufficient, surrounding surface soil should be used.

The sides of the hole should be broken in and the soil carefully

Brown rot on a peach. The fruit shown is capable of carrying over infection to the following season and fruit such as this should be destroyed.

PRUNING AND TRAINING A VINE





The sequence of pruning and training of a vine from time of planting to a fully developed spur-pruned vine 5 or 6 years later.

1A—Newly planted vine is pruned back to two buds.

2A—First season's growth: The foliage is tied to a stake to keep it off the ground and protect it from wind damage. Unless the vine is secured in this way, wind is likely to loosen it in the ground and form an opening for water around the stem, which may cause rot.

Growth should not be checked in any way the first season, as the object is to encourage a strong root system. Any check to the growth will retard root development, for as the roots feed the foliage so also does the foliage feed and develop the roots. Spraying should be attended to from the outset to maintain healthy growth. If any bunches are formed the first or second season, they should be removed, as cropping in the early stages of development drains the vitality of the vine.

1B—Second year's pruning: The strongest shoot is pruned back to two buds and all other growth cut off with the secateurs. Though the vine now appears similar to when first planted, a much stronger root systems belies its apparent lack of progress.

2B—Second season's growth: Growth is tied to the stake as for the first season. The shoot which will make the straightest trunk for the vine is selected and pinched off the top about 4in. below the bottom wire of the trellis. A new leader with short spaces (or internodes) between the buds will proceed from the break; the close spacing of the buds permits the formation of the two permanent arms from approximately the same level.

1C—Third year's pruning: All wood except the shortened cane selected to form the trunk is removed. This single upright cane is cut back just below the bottom wire and tied to the stake.

2C—Third season's growth: The shoots proceeding from the top two buds are trained one on either side of the trunk along the bottom wire as illustrated. All other growth is disbudded (rubbed off as it appears). In this way all the energy of the vine is directed into the development of the permanent structure of the vine, and the buds to form the spurs will be well spaced.

When these two top shoots have made about 4ft. of growth the tips are pinched off. This strengthens the wood and increases the fertility of the buds formed up to this juncture.

It is possible that each shoot will bear one or two bunches, which may be left to mature, as the vine will now be strong enough to support this.

1D—Fourth year's pruning: A cane of 3ft. or 4ft., the length depending on the vigour of the vine, is left on either side. Both canes should be pruned back to a bud on the under side. These buds will provide shoots the next season for further extension of the arms. It is easier and neater to bring a shoot from beneath the cane on to the bottom wire than one from a top bud.

2D—Fourth season's growth: From the wood laid down at the previous pruning the vine should produce about 15lb. of grapes. The vine always bears on wood formed the previous season. Training consists of carefully and gently tying the shoots from the terminal bud of each arm along the wire for the extension of the permanent arms, each of which may be made about 8ft. long, giving a total spread of 16ft.

The laterals formed on the fruiting wood should be tipped when extended about 6in. above the top set of wires. Further tipping may be necessary to limit the growth to this.

E—Fifth year's pruning: The laterals which carried the crop the previous season are pruned back to spurs of two buds. The new extensions of the arms formed the previous season are pruned back to give each arm a full length of 7ft. or 8ft. In commercial plantings where vines are growing in competition one with the other the maximum extension of the vine is usually about 10ft.

In the rich soil of the home garden vines can be given further scope with advantage. As large, extended vines often live to a great age and produce prolific crops, even 16ft. is by no means a limit in all circumstances. The vine pruned as above will produce fruit on the spurs and also on the cane laid down for extension of the arms.

pressed by foot so that the tree is held firmly. The hole should then be filled completely.

Where shelter is inadequate a stake should be driven in diagonally, pointing toward the prevailing wind, and the tree tied to the stake to stabilise it. Trees are best supported by tying binder twine first round the stake and then round the tree. Trees should never be tied so that stakes are in close contact with the bark, and looping of the ties round both the tree and the stake provides the necessary separation.

Pruning of Citrus

Pruning of citrus is broadly the same as for deciduous trees; to establish a well-balanced framework and to maintain a balance between vegetative growth and the production of large crops of good-quality fruit.

Regular light pruning of citrus is preferable to occasional severe pruning, which is seldom profitable.

Light pruning of twigs and small branches or the removal of dead or diseased wood may be carried out at any season of the year without harm to the trees, but the best time for pruning is after the danger of frost is past in spring.

Pruning Young Citrus Trees

Two principles are involved when pruning a young citrus tree:—

1. Establishment of the head.
2. Developing a sturdy branching framework to carry the crop.

Some young citrus trees arrive from the nursery with the head well developed and these need pruning merely to shape and extend the existing branches.

If it is necessary to establish a new head, the tree should be cut back to 30in. above the ground and a new head trained. From this height new branches will grow and further division of these is allowed each year until there are 8 to 10. This number of branches forming the framework is sufficient to give strength and at the same time allow the development of lateral shoots which will carry the crop.

Large branches in the centre of the tree should be removed both in training the tree and when maintenance pruning is in progress. Pruning to attain shape should be achieved in 7 or 8 years.

Exceptions to the general rule for pruning citrus occur with mandarins such as Thorny and Clementine, which produce numerous willowy branches. Weaker branches in these trees need to be removed annually to encourage sturdy growth.

Pruning Bearing Trees

As the trees reach bearing age much more attention to pruning is required. The object is to maintain the production of healthy fruiting wood by removing worn-out, diseased, and overcrowded branches. Though the height of the trees should be restricted to a reasonable level for picking and spraying, the lower limbs should be kept clear of the ground.

Pruning should start at the bottom of a tree. Any lateral branches within 18in. of the ground should be removed or shortened. From time to time older branches are forced down by the weight of fruit. These must be removed to maintain the bearing efficiency of the lower part of the tree. Removal of these branches also lessens the possibility of citrus brown rot.

Long side branches should be removed or shortened to strong side shoots, depending on how crowded the branches are.

Very little pruning of healthy growth that is not crowded will be necessary except on mandarin trees.

It is in the tops of trees that the first signs of debilitation and old age appear. Light thinning of the tops of trees allows more room for healthy bearing branches and at the same time determines the height.

Leading branches must not be cut back to bare sticks, but always to strong side growths or they will die back.

Orange and New Zealand grapefruit trees require less pruning than mandarins, but some attention is required to keep their top branches vigorous.

The limitation of tree height has advantages when spraying and picking is being done, but if it is carried too far, these advantages may be outweighed by the loss of fruit-bearing surfaces.

Pruning Neglected Trees

Damage by bark diseases or attacks by borer, especially in the lower branches and trunk, should be assessed before any renovation of neglected trees is attempted.

If these diseases and pests have caused severe damage, it may be preferable to remove the tree and replant. Severe pruning is profitable for neglected trees. All dead and diseased branches and those which are badly crossed should be removed. Branches which are badly placed or tend to crowd the tree should be cut out. Those branches which show weak growth toward the ends should be cut back to healthy shoots.

As much healthy foliage should be saved as can be left without unduly interfering with the pruning.

The application of heavy dressings of manures or fertilisers in spring before the severe pruning of neglected trees will hasten their recovery.

Trees should respond to the treatment by throwing out numerous and vigorous young shoots. No further pruning is required until the following spring, for the trees need the new growth to maintain healthy roots.

The trees can be expected to bear a reasonable crop in about 3 years from the original pruning.

All large cuts in pruning should be sealed with grafting sealer or heavy petroleum jelly.

Outdoor Grapes

Grapes can be grown successfully in many types of soil, but the most suitable is a sandy loam. In soils rich in humus the vines tend to make excessive growth. No manure should be used in such soils.

Varieties recommended for outdoor culture are:—

Black grapes: Alphonse Lavallee, Dolcetto, Muscat Hamburgh, Black Hamburgh, Albany Surprise, Seibel 4643, and Seibel 5455.

Pink grapes: Chasselas Rose Salomon, Chasselas Rose Royale, Ferdinand de Lesseps, Plovak, Iona.

White grapes: Madeleine Royale, Madeleine Alice Salomon, Golden Chasselas, Diamond, Cannon Hall Muscat, Dr. Hogg Muscat, Dattier de Beyrouth, Muscat de Frontignan, Muscat de Terricina, Chasselas Persille, Riesling Sylvaner.

Bulletin No. 291, "Grape Growing in the Home Garden", which is available free from the nearest office of the Department of Agriculture, deals with varieties, training and pruning, and diseases of grape vines.

Planting

The best time to plant cuttings is in August. Cuttings should be about 8in. long and buried so that only one bud is exposed and this is lightly covered with soil to suppress bud movement until the roots start to develop. The strike from cuttings is improved if the wood is soaked in water for a day before planting.

The hole for planting a grafted or rooted vine should be made about 2ft. wide by 1ft. deep. It should be filled to a depth of 6in. with good topsoil and old bones, if available, and the vine roots set on this. If the area is not well drained the subsoil should be broken up before the hole is filled in. It is important that the vine should not be planted deeper than 6in.

Grafted vines should be planted so that the union is just above ground level and earth mounded up to the top bud. This protects the vine until root action begins. Once the vine has commenced growth the soil mound around the vine should be levelled off.

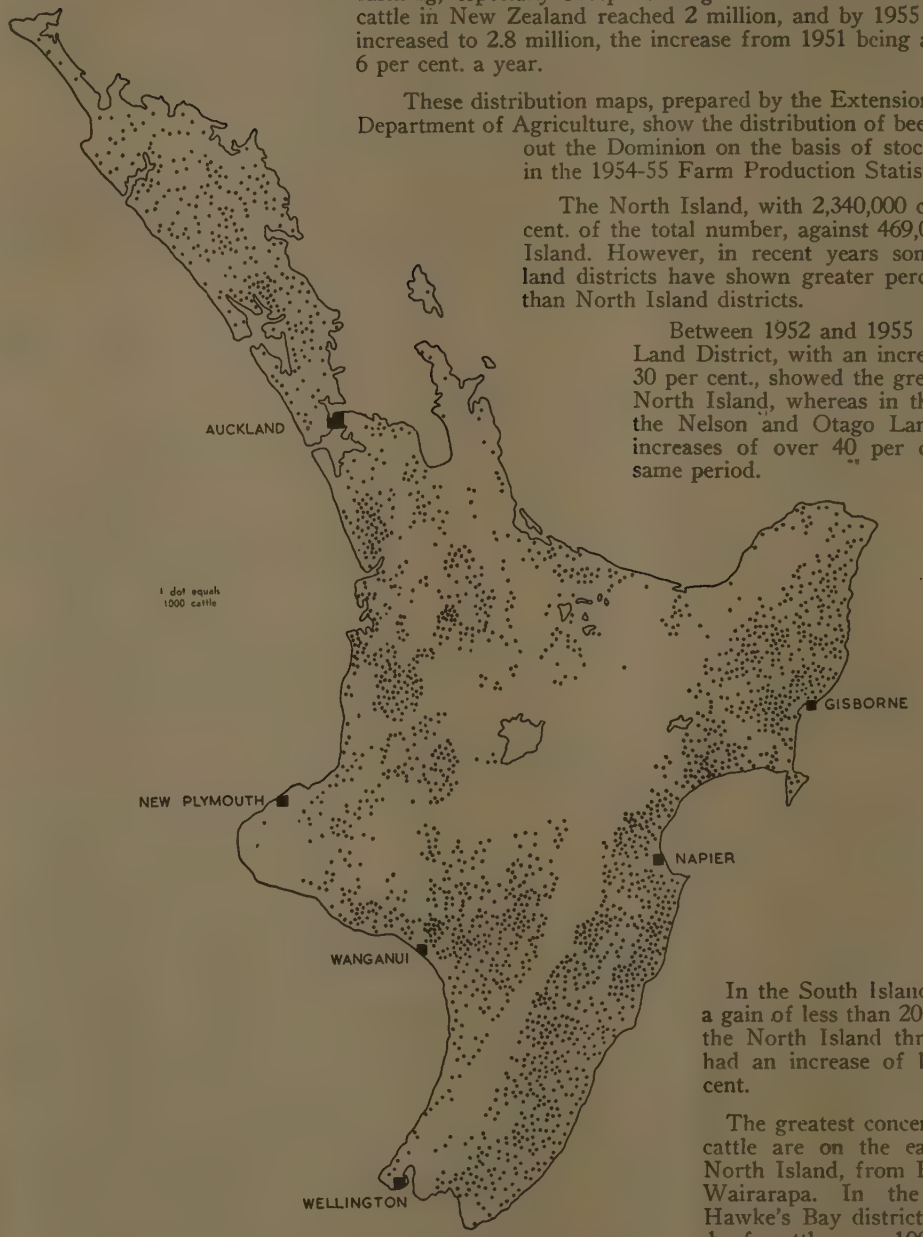
DISTRIBUTION OF BEEF CATTLE IN NEW ZEALAND

Since the Second World War interest in beef cattle has been growing in New Zealand, and up to 2 years ago prices for beef gave impetus to an industry which, in this country, has always been a subsidiary of other farming, especially sheep farming. In 1945 the total number of beef cattle in New Zealand reached 2 million, and by 1955 the number had increased to 2.8 million, the increase from 1951 being at a rate of over 6 per cent. a year.

These distribution maps, prepared by the Extension Division of the Department of Agriculture, show the distribution of beef cattle throughout the Dominion on the basis of stock numbers given in the 1954-55 Farm Production Statistics.

The North Island, with 2,340,000 cattle, has 83 per cent. of the total number, against 469,000 in the South Island. However, in recent years some South Island land districts have shown greater percentage increases than North Island districts.

Between 1952 and 1955 North Auckland Land District, with an increase of just over 30 per cent., showed the greatest gain in the North Island, whereas in the South Island, the Nelson and Otago Land Districts had increases of over 40 per cent. during the same period.



In the South Island no district had a gain of less than 20 per cent., but in the North Island three land districts had an increase of less than 20 per cent.

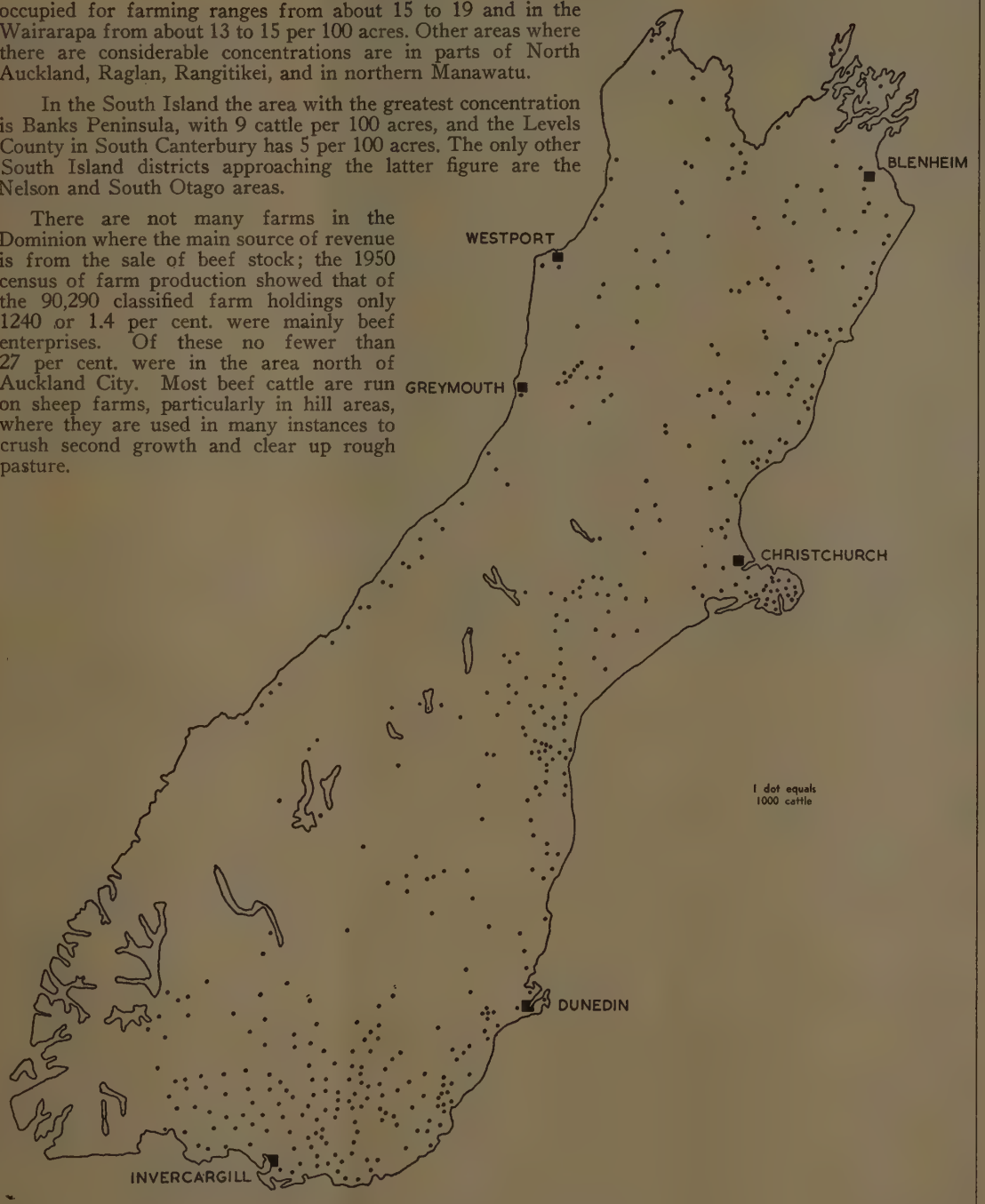
The greatest concentrations of beef cattle are on the east coast of the North Island, from East Cape to the Wairarapa. In the Gisborne and Hawke's Bay districts the number of beef cattle per 100 acres of land

DISTRIBUTION OF BEEF CATTLE

occupied for farming ranges from about 15 to 19 and in the Wairarapa from about 13 to 15 per 100 acres. Other areas where there are considerable concentrations are in parts of North Auckland, Raglan, Rangitikei, and in northern Manawatu.

In the South Island the area with the greatest concentration is Banks Peninsula, with 9 cattle per 100 acres, and the Levels County in South Canterbury has 5 per 100 acres. The only other South Island districts approaching the latter figure are the Nelson and South Otago areas.

There are not many farms in the Dominion where the main source of revenue is from the sale of beef stock; the 1950 census of farm production showed that of the 90,290 classified farm holdings only 1240 or 1.4 per cent. were mainly beef enterprises. Of these no fewer than 27 per cent. were in the area north of Auckland City. Most beef cattle are run on sheep farms, particularly in hill areas, where they are used in many instances to crush second growth and clear up rough pasture.



Indiscriminate Dosing of Pigs with Phenothiazine Not Recommended

By P. L. THOMAS, Scientific Officer, Department of Agriculture Animal Research Station, Wallaceville, and E. J. H. FOLLEY, formerly Livestock Instructor, Department of Agriculture, Levin

DURING the summer of 1955-56 the practice arose among some pig farmers in Horowhenua County of dosing with phenothiazine any young pigs which failed to thrive. This treatment was claimed to give phenomenal increases in weight gains and the practice appeared to be spreading. In no case was there a planned experiment with adequate controls. A controlled trial by the Wallaceville Animal Research Station in co-operation with Allen Bros., farmers, Levin, has confirmed that phenothiazine has no growth-promoting effect in worm-free but otherwise unthrifty pigs; in any case, phenothiazine is not the most effective treatment for worms in pigs.

THE evidence obtained by L. K. Whitten of the Wallaceville Animal Research Station and published in 1954 showed that the incidence of worms (particularly ascarids) in pigs was very low in the North Island. The diagnostic records at Wallaceville show that in the North Island the number of pigs infested by worms of any sort is probably very small and this has been attributed to the fact that most of the pigs are fed liberal quantities of skimmed milk. It was considered unlikely, therefore, that the ailing pigs were affected by worms and that the action of phenothiazine in promoting the suggested increases in weight was the result of any effect on intestinal worms, especially as this chemical is far less efficient against worms in pigs than in other animals, except against the nodule worm *Oesophagostomum dentatum*. In addition, the risk of poisoning in pigs is greater than in other farm animals dosed with phenothiazine, and its indiscriminate use is not recommended.

A farmer who was considering dosing his pigs with phenothiazine and who required information about dosing rates approached one of the writers at the end of February 1956. The pigs were weaners and porkers which were not doing well. Post-mortem examination of those which had died had revealed that salmonellosis was the cause of death and that no worms were present. A controlled trial was arranged. In this case no worms were present and any response to dosing would have been due to some other factor than anthelmintic effect, such as the effect of the iodine in the phenothiazine on the thyroid glands.

Method

Twenty-five porkers and 33 weaners were used as two separate observational groups. Body-weights were taken after 12 hours' fasting and the two groups (porkers and weaners) were then subdivided at random into dosed and undosed groups. The dosed porkers were each given 20 gm. of phenothiazine in ½lb. of crushed barley. After dosing, the pigs were all kept on a liberal diet of skimmed milk and crushed barley. The porkers, dosed and undosed, shared the same troughs. The weaners were kept in separate pens according to their group, but care was taken that they all received the same ration.

The pigs were reweighed after 14 days under observation. It was possible to keep 28 of the weaners for a further 5 weeks, and the weights of these were subsequently compared as groups of 15 dosed and 13 undosed over the extended period. During these final 5 weeks the dosed and undosed pigs were kept in separate pens and fed as much as they would eat. The dosed porkers gained an average of 6lb. each in 14 days after dosing and the undosed animals gained an average of 5lb. each. In the weaner group the undosed animals gained more (2lb.) in the first 14 days than the dosed ones (1.1lb.), and of those observed for a further 5 weeks there was an average of 1lb. difference in favour of the dosed animals.

These differences are not significant. It is noticeable, moreover, that all of these animals remained unthrifty, as shown by their slow rate of growth.

Results

The weights of the pigs are shown in the following table:—

Porkers	Dosed (13 pigs) mean weight lb.	Undosed (12 pigs) mean weight lb.
Original weight ..	62	64
Weight after 14 days	68	69
Increase	6	5

Weaners	Dosed (16 pigs) mean weight lb.	Undosed (17 pigs) mean weight lb.
Original weight ..	22.5	21
Weight after 14 days	23.6	23
Increase	1.1	2

Reduced group of weaners under extended observation	Dosed (15 pigs) mean weight lb.	Undosed (13 pigs) mean weight lb.
Original weight ..	21	21
Weight after 14 days	23	23.5
Weight after 7 weeks	34.5	33.5
Increase	13.5	12.5

Conclusions

It is concluded that:—

1. Phenothiazine has no growth-promoting effect on worm-free but otherwise unthrifty pigs.
2. Though there were no harmful results in the case described, dosing phenothiazine to pigs which are unthrifty from undiagnosed causes cannot be expected to be beneficial.
3. Because of the low incidence of worms in pigs in the North Island it is essential that a positive diagnosis of worms should be obtained before pigs are treated. Diagnosis of worm infestation is quick and simple. Failure to check on worm infestation before treatment may well delay a proper diagnosis of the true cause of the unthrift.
4. Where a positive diagnosis for worms is reached it should be remembered that phenothiazine is not the most effective anthelmintic available for use against ascarids and its use against other worms is not entirely without risk. Sodium fluoride is more effective, though not safe for swill-fed pigs, and the drugs of choice are the various compounds of piperazine now freely available.

Ruakura Farmers' Conference Week

THE programme for the ninth Farmers' Conference Week of the Department of Agriculture's Animal Research Station, Ruakura, promises to be well up to the high standard which has been maintained since the inception of the week. The conference, which will be held for the first time in the new Ruakura Farmers' Hall, will open on Tuesday 11 June and will continue until Friday 14 June.

Though it is not expected that the new hall will be completely finished, it is hoped that it will be sufficiently far advanced to enable the conference to be held in reasonable comfort.

However, it is certain that any small inconvenience will be far outweighed by the great improvement on the previous inadequate accommodation arrangements.

As in other years a feature of the week will be the field day on Wednesday. A bus service to numerous display points makes it possible for farmers to appreciate readily the wide range of work being done at the sheep and dairy sections of the Station.

Leading New Zealand agricultural research workers will give papers and other addresses on topical subjects are set down. On the evening of the field day there will be a session "Trace Elements in Pasture and Animal Nutrition" led by Dr. I. J. Cunningham and Dr. E. B. Davies.

Farm Building Construction

By H. W. T. EGGERS,
Engineer, Department of Agriculture, Wellington

IN the first article in this series, which was published in last month's issue of the "Journal", the construction of building foundations in concrete was described. This article deals with the erection of the framing or skeleton, which acts as a support for the sheathing and roof of the building, and next month's article will discuss roofing materials.

IN the building trade certain terms and names are given to frame and structural parts and to methods of construction. An understanding of these terms is necessary, as their use will occur frequently in this series.

As all constructional features of framed structures will be discussed, a simple combined implement and store shed will be taken as an example and all features incorporated in the one building. A plan and elevations of this building are given in Fig. 1, in which the names of different parts are shown.

Structural Theory

As the framework of a building is the load-carrying part, all its members are subject to various loads according to their positions and functions. Each member must be so proportioned that in conjunction with its auxiliary members it will carry the load with a reasonable margin of safety. Too great a margin of safety means the use of uneconomical timber sizes, whereas too small a margin may lead to failure. Because of this, sizes of timber used in framing a building are proportioned to give greatest safety with maximum economy.

The loads that can be placed on structural members are:—

1. **Compression**, in which the load forces have a squeezing effect on the member.

2. **Tension**, in which the load forces tend to stretch the member.

3. **Bending**, in which the load forces tend to cause bending.

4. **Shear**, in which the load forces are applied close together but in opposite directions at right angles to the axis of the member.

These loadings are shown in Fig. 2.

Careful and accurate workmanship is necessary in all stages of building construction. The effect of bad workmanship is illustrated in Fig. 3, which shows at left, a stud in compression cut square and bearing evenly on the plate and at right a similar stud carelessly cut to cause its load to be carried by about a quarter of its full bearing area. For example, if a 4in. x 3in. stud has to carry a load of 300lb. and is cut square, the load is distributed evenly over the end of the stud at a pressure

$$\frac{300}{12} = 25\text{lb. per square inch.}$$

If this load is distributed over an area of 3 sq. in. only (as in the right-hand stud in Fig. 3), the load per unit area is brought up to 100lb. per square inch, a loading which might quite easily cause failure of the stud.

Timber has a much greater power to resist compression than tension and in larger buildings where some structural members may be required to carry a high tensile loading these members are usually steel.

In an ordinary building such members as piles, studs, and rafters are typical compression members, and collar ties are tension members; lintels and ceiling joists are subject to bending, as they are supported at the ends and the load is applied somewhere between supports; floor joists are subject to shear in the proximity of sleeper plates and bending between plates. Shear is a loading usually resulting from one or more of the other three loadings, and bending produces both compression and tension in the same member.

Fastenings

In any structure the weakest parts are likely to be the joints. This is as true of frame construction as of any other type.

Timber-framed structures are built according to methods and rules worked out through long experience of what will and will not serve the purpose. Size and spacing of members, spans, bracing requirements, etc., have all been established by cut-and-try methods. Buildings erected according to these rules have given good service on the whole, which is one reason why more exact designs based

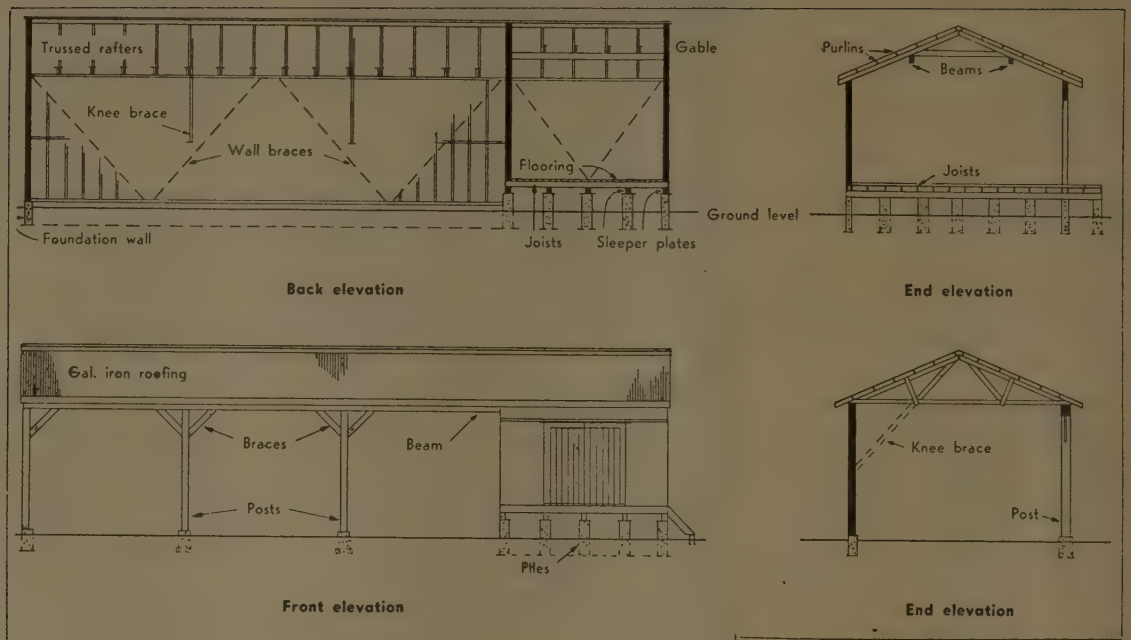


Fig. 1—Plan and elevations of a combined implement and store shed.

on engineering analysis of loads and other requirements have not been developed. Established practices have on the other hand received engineering analysis and what has been found faulty has been rejected and the sound practices adopted as the basis of the "New Zealand Standard Code of Building By-laws", which was referred to in the previous articles in this series.

Nails

Under the heading "Nailing and Fastening" the Standard Code states:—

"The wooden framework of all buildings shall be connected together in a secure manner, and connections between the various parts shall be such that all forces will be adequately resisted.

"Sarking, flooring, and exterior finishing timber shall be fastened with nails which shall be at least two and one half times the finished thickness of the attached material.

"Sarking and flooring shall be nailed to each rafter or joist with not fewer than two nails per piece, except that flooring which is 3in. or less in width and which is secret nailed need be fixed to each joist with one nail only.

"Weatherboarding shall be securely fixed to the studding by nails not less than 2½in. in length spaced not more than 4½in. apart with at least one nail fixing each board to each stud."

Though the Standard Code stipulates that "wooden framework shall be connected in a secure manner," it does not indicate the best way of achieving this. This information can be obtained from the results of research carried out in the U.S.A. into the strength of nailed joints and is briefly as follows.

Heavy-gauge nails give considerable increase in strength over light-gauge nails.

Four light-gauge nails are stronger than two heavy-gauge for fastening two members.

Skew nailing, though causing greater splitting and requiring more skill to do satisfactorily, has much greater holding power than end nailing; the detrimental effect of splitting is not as severe with skew nailing as with end nailing.

Nailed joints in timber which has already seasoned are much stronger than nailed joints in green timber which is subsequently allowed to season.

Examples of nailed joints are shown in Fig. 4.

Skew nailing should therefore be used wherever end fastening is necessary, such as for studs to plates, and two or more smaller-gauge nails are preferable to half the number of heavy-gauge nails. Generally a nail slope of 30 degrees is most effective for skew nailing, the nail being driven so that at least half its length is in the lower member.

Bolts

Bolts can be used to advantage as a fastening in structural framework having large dimensioned members or

where members are in tension and strapping is required. Bolting is a very convenient method of fastening members for truss or clear span roof construction. To tabulate the most economical spacing and bolt diameters for bolted joints is not possible because of the multiplicity of loadings, member sizes, etc.; each joint must be designed with adequate strength for its particular loading and if bolted construction is contemplated, competent advice should be sought concerning member sizes and methods of bolting.

Concerning bolts the Standard Code states: "All bolts used with timber shall be provided with washers of such proportion as may be necessary to prevent undue compression on the wood at the face of the washer."

Timber Connecters

Timber connecters can be used to advantage either in strengthening existing structures or on new construction. They consist of steel rings either plain or corrugated and are driven or recessed into adjoining members with half the ring in each member. They can be used either alone (the corrugated type) or in conjunction with bolts or nails (the plain type) to increase greatly the strength of the joint to which they are applied.

Typical connecters are shown in Fig. 5.

Connecters distribute the shear load on the normal fastenings over a much greater area, transmitting it evenly over nearly the full width of the members and thereby enabling fewer fasteners to be used and bringing the joint strength more in line with the strength of the individual members.

Special tools are required for cutting the channels to accommodate split ring or flange plate connecters; others can be inserted between bolted members and pulled in with the bolts.

Framing anchors can also be used advantageously in timber construction.

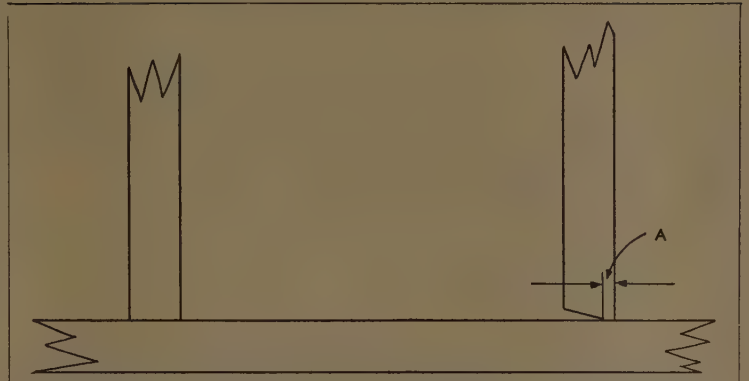


Fig. 3—Result of careless cutting of studs. The load-carrying surface of the stud at left is the full area of the bottom, but that of the one at right is restricted to the position in contact with the plate (A).

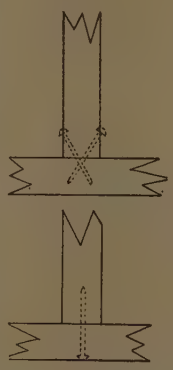


Fig. 4—Nailed joints. Upper—Skew nailing. Lower—End nailing.

These are illustrated in Fig. 6, which is self-explanatory.

Standard of Farm Building Construction

As the personal risk involved in urban structures is relatively great, local building codes set standards regarding design loads and working stresses below which construction is not permissible. Because the personal risk in a farm structure is not as great, much lighter construction can be used. This lighter construction, however, may be too light and therefore a bad risk.

It is good policy to have any structure engineered, as a building constructed without engineering advice may be very poorly balanced and be overstrong in some points and critically weak in others. An engineered structure is never too expensive. The responsibility of the engineer is to follow design recommendations and do the best job possible with the material available to the satisfaction of the owner. He is not concerned with who builds the structure, but with how it is built.

Framing Construction Methods

The framing of the typical farm building in Fig. 1 can be constructed in three sections—the floor, the walls, and the roof. As there is no floor in the implement shed section its construction comprises only walls and roof.

The wall framing of any building consists of top and bottom horizontal plates, between which are vertical studs, which act as supports for the external and internal coverings (if any) and the roof. This framework is interspaced by openings for doors and windows and is braced to resist any lateral forces which may be imposed on it.

In the implement shed section, where the floor is soil or concrete, the bottom plate of the wall framework can be placed directly on the foundation walls (Fig. 7), but though this method can be used in the raised floor section, it is more common to support the bottom plate on the floor joists, which in turn rest on the sleeper plates.

After the foundations have been prepared as described in the preceding article in this series, complete with holding down bolts for walls and wire ties for piles and have been arranged all reasonably level, timber construction can be started on the raised store with the laying of sleeper plates.

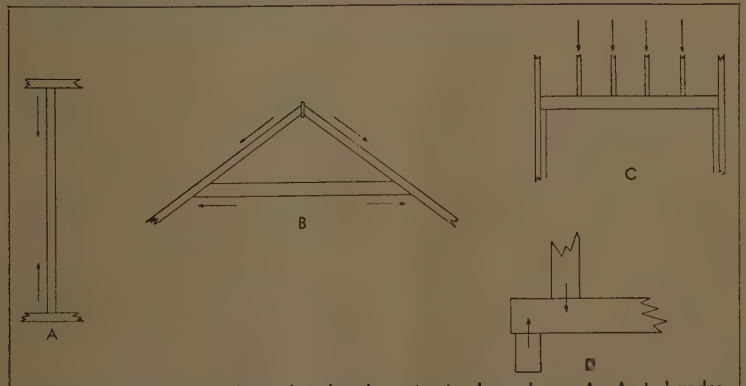
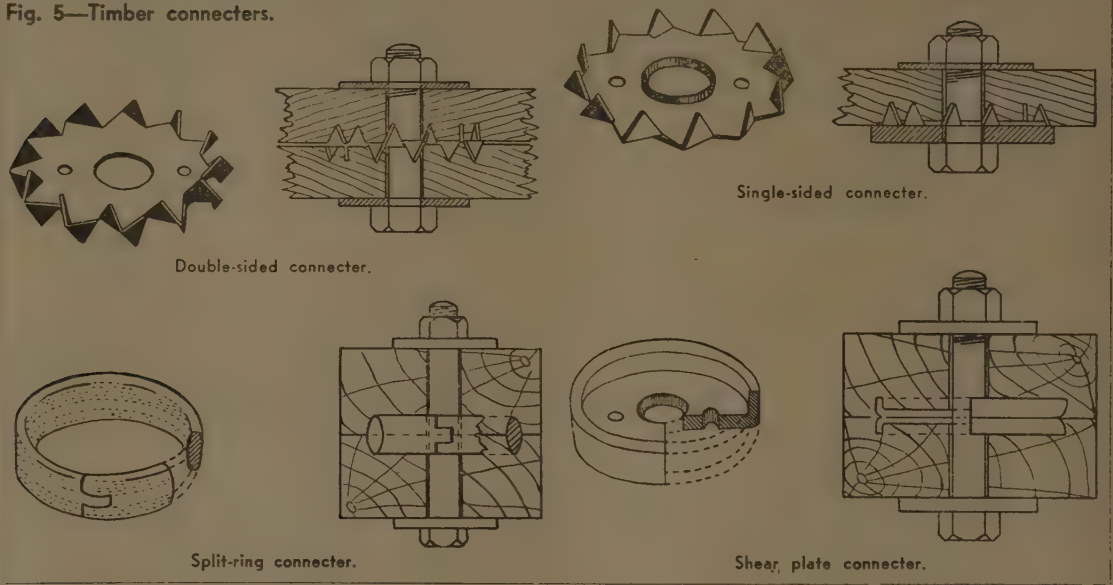


Fig. 2—The loadings which can be placed on structural members. A—A stud under compression. B—A collar tie under tension. C—A lintel under bending. D—A joist under shear.

Fig. 5—Timber connecters.



Foundation walls, piles, or piers of brick, stone, or concrete conduct moisture from the soil by capillary action and it is therefore necessary to protect the timber in contact with such foundations from moisture which would set up decay. This is accomplished by inserting a damp-proof course between the timber and the foundation which for convenience of application usually consists of a strip of bituminous fabric the same as used for roofing material. This material can be purchased in rolls 6in. wide and should be laid on the foundations before the sleeper plates are positioned. Any holes for holding down bolts should be carefully cut in the damp course and joints given an adequate overlap.

The Floor

The floor of the fertiliser store shown in Fig. 1 is built up of 6in. x 2in. floor joists at 18in. centres resting on 6in. x 4in. sleeper plates. This floor is designed for a loading of 500lb. per square foot, so that this 15ft. x 20ft. store can hold approximately 66 tons of fertiliser.

The piles are proportioned both in size and number to give adequate support for this loading as described in the previous article in this series.

The floor joists support wall plates for both the outside walls and the partition wall between the store and implement shed.

Joins in sleeper plates on piled foundations must be made over the piles, the joints being halved or scarfed and well nailed.

Fig. 7 shows that the sleeper plate of the implement shed section is placed on a continuous wall foundation and it may also constitute the lower wall plate. Whether laid as a sleeper plate or wall plate, it must form a continuous bearer, with all joints halved or scarfed.

With one corner of the building being used as a starting point the lengths of timber should be laid along the foundation with allowances for scarf laps. This will ensure most economical use of various lengths and a minimum of cutting; it will also avoid the joints coinciding with holding down bolts.

The next step is to half check or scarf the various pieces and bolt them to the foundations. For preference checks should all face in the same direction. If the timber is dry and subject to splitting when nailed near the ends, lap checks may be extended to more than the width of the timber or alternatively holes slightly smaller than nail gauge can be drilled for the nails.

As checking proceeds the timbers should be laid on the foundations one length at a time up against the holding down bolts so that the bolt centres can be marked off down the length of the timber. Unless bolts have been very accurately placed, there will be some variation in their positions with relation to the centre line of the plate. This variation can be checked by measurement and corresponding corrections can be made in marking the positions of the hole centres in relation to the width dimension.

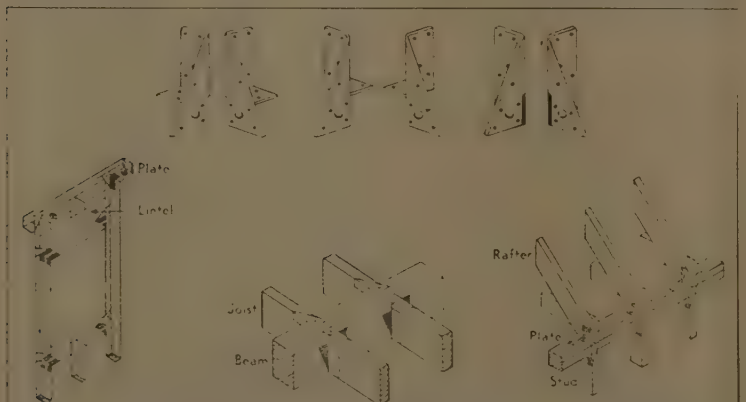


Fig. 6—Upper: Types of framing anchors. Each pair consists of a left-hand and right-hand unit. Lower—Typical uses of different framing anchors.

Holes should be drilled ⅛in. larger than the diameter of the bolts and all bolts in any one length of timber should be tapped vertical before the plate is placed over them. By doing each piece singly and in rotation all lap joints can be butted up tightly.

When sleeper plates supported on piles are fastened down, a strip of damp course material must be placed between the plate and the piles and after the plates have been positioned and levelled the wire ties in the piles can be bent over and stapled.

As sleeper plates form a level support for floor joists, they should be level both ways across the building and in relation to each other. If outside plates have been laid true, intermediate plates are best levelled between the outside plates by eye. Even with careful working there is certain to be some variation in the height of supporting piles and this can be corrected by the use of packing strips which must be not less than the width of the plate. Two or more thicknesses of the bituminous fabric used for the damp course can be used for slight adjustments.

Floor Joists

As the floor forms a level surface on which the remainder of the building is erected, any difference in thickness of floor joists provided for varying spans and loadings must be compensated for below floor level. This is done by altering the heights of foundation and plate levels to suit the thickness of the floor joists so that these joists when laid are level over the whole area. Fig. 8 illustrates this.

Once the foundations and plates have been laid for a building the floor joists can be positioned to find the best use of timber lengths and can then be nailed to the plates. Provided any joist is carried by two or more plates, there is no necessity for cutting at joints, as joists can be overlapped as shown in Fig. 9. The method of spacing joists at the sides of the building at right angles to the direction of the sleeper plates to support both wall framing and floor is also shown. These are the only joists which require cutting square at joints, as they must be butted and cannot be overlapped except by scarfing. The inside joist is offset not only to support the wall plate but to provide "land" for flooring.

This method is also used where it is intended to erect load-bearing internal partition walls such as may be required in a dwelling either for roof support or as lateral bracing partitions for outside walls.

As slight variations may occur in "run of the mill" timber sizes, it is a good plan when floor joists are being laid to place, but not nail down, joists of equal thickness at random across the whole floor area. Placing and nailing should then be started at one side and as they progress through to the other side the level of joists should be checked with a straight-edge. By

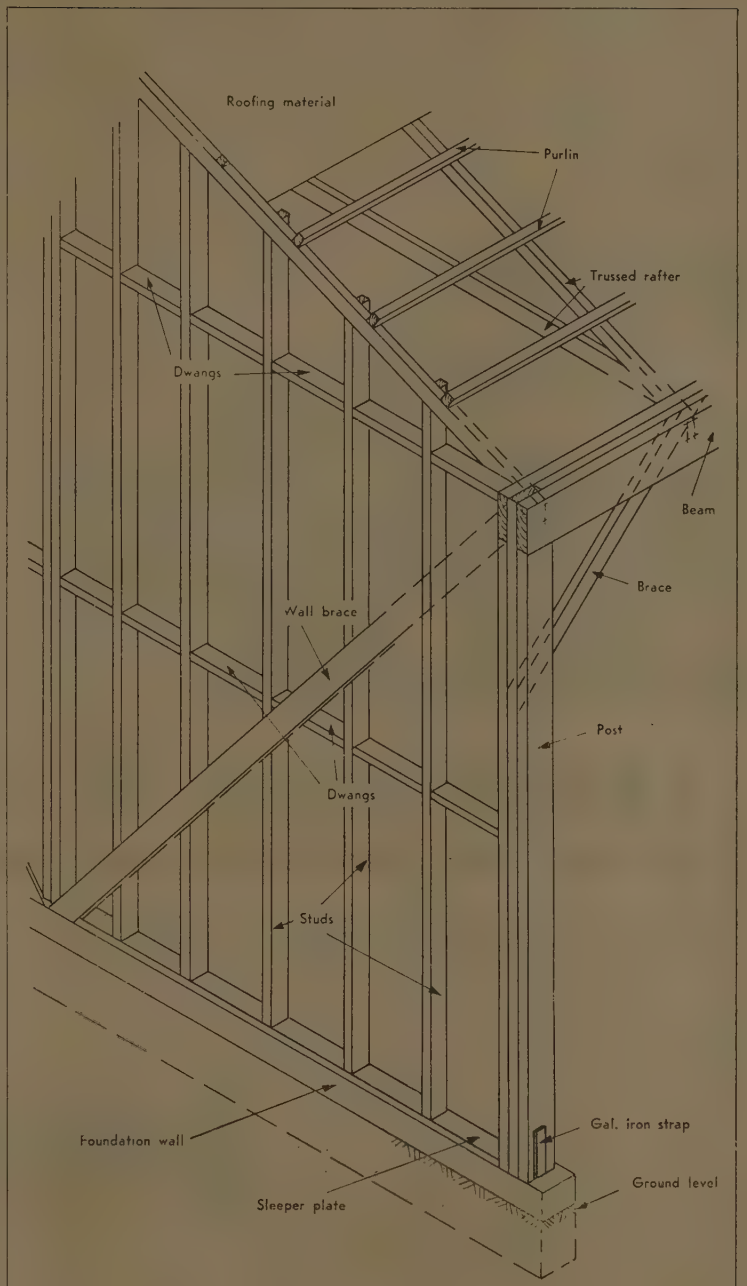


Fig. 7—Part of an end wall of the implement and store shed illustrated in Fig. 1. The sleeper plate is placed on the continuous wall foundation and is used as the lower wall plate.

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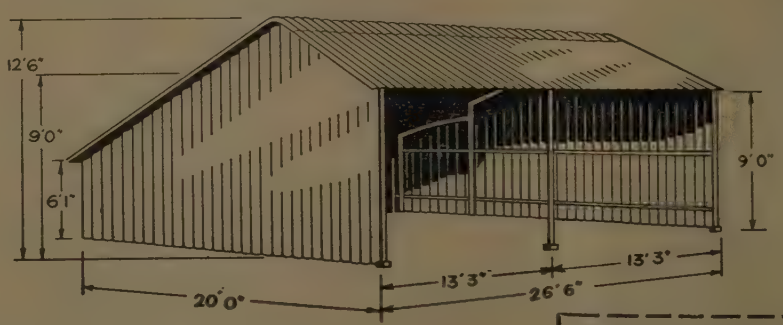

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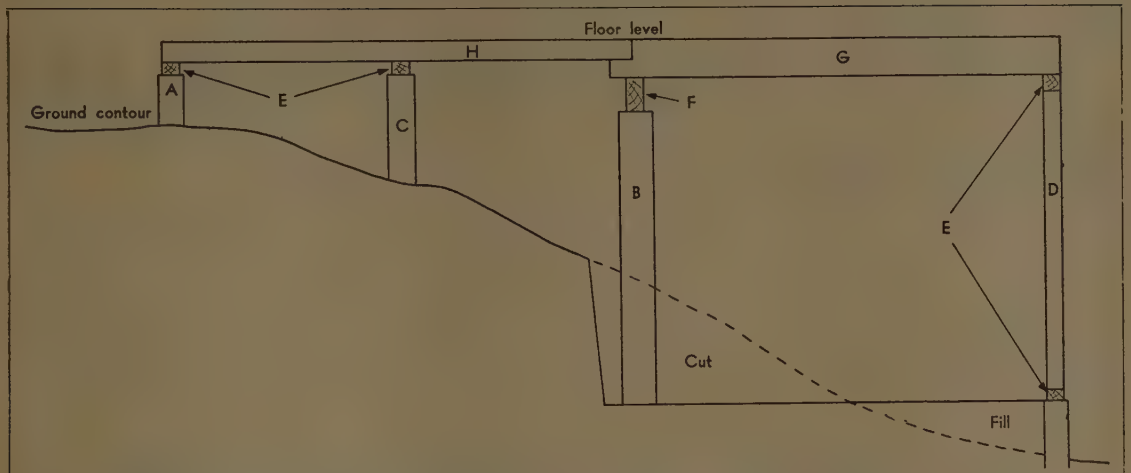

Fig. 8—Variable height foundations. A—Continuous wall outer foundations. B—Reinforced-concrete pier. C—Concrete pile. D—Jack studding. E—Sleeper plate. F—Beam. G—10in. x 2in. floor joist. H—5in. x 2in. floor joist.

slight packing or cutting of joists the necessity of having subsequently to level joists with the plane can be largely avoided.

Floor joists represent the level table top on which the building is erected, so they must be placed to be available to support any loads which the building may impose on the floor. The Standard Code recommends as follows concerning floor joists:—

"Floor joists shall be of sufficient strength and stiffness to carry the loads required for the building without exceeding the safe working stresses. They shall be securely fixed in position and shall not be spaced at a greater distance than 18in. when the floor boards do not exceed 13/16in. in thickness. When the floor boards exceed these dimensions the joists may be spaced at relatively greater distance, but they shall provide equal strength and stiffness."

Table 1 gives the maximum span for various sizes of floor joists. (This table is designed for normal floor loadings; for loadings such as a fertiliser store special design is necessary.)

TABLE 1—MAXIMUM SPAN FOR VARIOUS SIZES OF FLOOR JOISTS

Size of Joist	Maximum span	
	Class (a): Live load of 40lb./sq. ft.	Class (b): Live load of 60lb./sq. ft.
	ft. in.	ft. in.
4in. x 2in. ..	5 6	5 0
5in. x 2in. ..	7 0	6 6
6in. x 2in. ..	9 0	8 0
7in. x 2in. ..	10 6	9 6
8in. x 2in. ..	12 0	10 6
9in. x 2in. ..	13 6	12 0
10in. x 2in. ..	15 0	13 6
12in. x 2in. ..	19 0	17 0

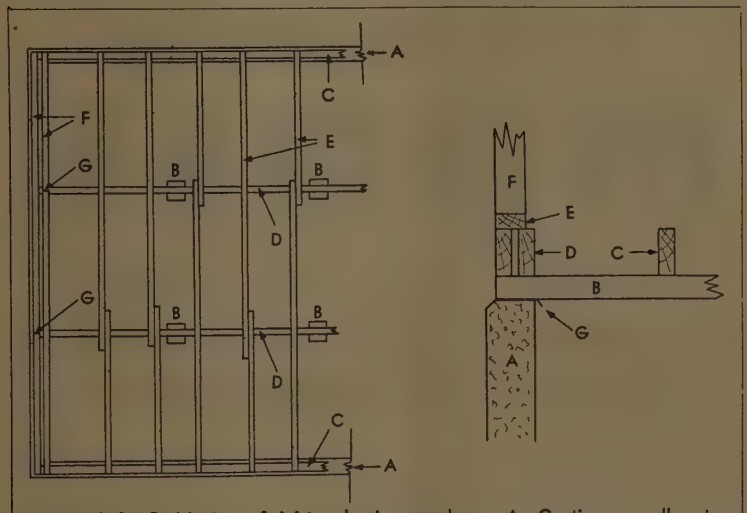

Fig. 9—Left: Positioning of joists, showing overlaps. A—Continuous wall outer foundations. B—Internal foundation piles. C—Outer sleeper plates. D—Inner sleeper plates. E—Floor joists. F—End floor joists. G—Butt joint or half check scarf. Right: Use of double joist at end of building to support the wall plate and give "land" for flooring. A—Outer foundations. B—Sleeper plate. C—Floor joist. D—End floor joists. E—Bottom wall plate. F—Stud. G—Damp course.

"Joists under bearing partitions and running parallel thereto shall be doubled and well spiked or separated not more than 6in. by solid packing the full depth of the joists and spaced not more than 24in. centre to centre and well spiked.

"Trimmers and trimmer joists [joists at right angles which support the ends of ordinary joists which have been cut] shall be adequately proportioned and shall be at least 1in. thicker than ordinary floor joists except when the loading to be supported is, in the opinion of the Engineer, light, in which case they may be the same as adjacent joists.

"Where any trimmer supports five or more joists the trimmer shall be secured to the trimmer joists by a ½in. threaded rod with nut and washer connecting both trimmer joists or by connecting of each end of the trimmer to the trimmer joist with an angle iron cleat bolted to both the trimmer and the trimmer joist."

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(and therefore cost) can be saved if any under floor work required for these two items can be carried out then.

Water pipes for both hot and cold services should be run and saddled to the floor joists. Their ends should be finished with the fittings necessary to facilitate any vertical connections, and holes to accommodate these connections can be drilled in plates as they are laid, much avoidable hacking and awkward drilling which occur when pipes are run after the frame is completed thereby being saved.

Waste pipes and lavatory flush pipes can also be placed much more conveniently while the frame is being erected than if left until construction is well advanced.

Wiring for electrical services may also be done with advantage while the building is in progress.

Sub-contractors for both plumbing and electrical work greatly appreciate the co-operation which can be given in this way and therefore can do a job which will not only cost less but be more satisfactory.

The Walls

After the floor joists have been laid the next step in construction is the framing of the walls. There are two methods of carrying out this work:—

1. The frames can be laid out and built horizontally on the floor joists ready for raising to the vertical position in one operation, or

2. The frames can be built in situ from the bottom plate up.

Both methods have advantages, the former being preferred by professional builders because it ensures more rapid construction if labour is plentiful. Where labour is a consideration or for amateur builders the second method is probably more suitable. Whichever method is adopted, a high standard of accuracy in cutting and measurement is required to ensure that all component parts fit accurately together.

In method 1 the frame components are cut and fastened together in a horizontal position on the floor joists to form panels of a suitable size for erection. These panels are complete with the correct openings for doors and windows and bracing and may form the whole framing for one side of the building or for only a section of a side. They are so constructed that they require nailing together only after being raised to complete the whole wall framework of the building.

The usual method for small buildings is to construct the frames one on top of the other in the reverse order to which it is proposed to erect them and, when all the walls are complete, to erect them in order and nail them together. Temporary braces are required to support the framework until internal partition walls or a roof structure is added.

In method 2 the top and bottom plates for a wall are first placed side by side and the full-length stud positions squared off across both plates. All joins in the timber forming the bottom plate must be over a floor joist and any joins in the timber forming the top plate must be made over a stud. All studs are then accurately squared and cut to a template to ensure all being of identical length. The bottom plate is then nailed to the floor joists, the corner and some random studs are lightly nailed and temporarily braced, and the top plate is nailed on. The frame is then set truly vertical with a plumb bob, the studs are permanently nailed, and all intermediate studs are fitted to the positions marked and nailed and temporary braces made secure.

Bracing, horizontal timbers for lintels, and sills for doors and windows are added after the skeleton frame is erected as also are any jack studs above or below window openings.

In construction of the shed shown in Fig. 1 both methods of wall framing must be adopted, as the building of implement shed beams into the wall of the fertiliser store prohibits pre-erection construction of this side wall. Both outside side wall and front wall can be constructed before erection.

In buildings where internal lining is required a third full-length stud has to be provided at corners as shown in Fig. 16 to give land for the lining on one wall.

Framing Technique

It may appear that a saving in timber could be achieved by omitting the lower wall plate on the sides of the building parallel to the sleeper plates and footing studs directly on the sleeper plate. This practice is not advisable, however, and any saving in timber can be more than offset by the detriment which accrues from it.

Wood shrinks most crosswise of the grain and only negligibly lengthwise. Unbalanced shrinkage leading to plaster cracks in walls occurs when the studding of one wall rests on the foundation plate and the other wall on the joists. Balanced shrinkage may be obtained by avoiding the use of "on-edge" material in or under the wall where possible or by using the same amount all round, which is what is done in the construction shown.

The above description of framing technique has assumed the use of parallel top and bottom plates. In the fertiliser store section of the building shown in Fig. 1 the front and back walls only will have parallel plates, the side wall top plate forming the end gable rafter of the roof. This top plate is laid on edge and the studs are halved to accommodate it.

The system of framing these panels by method 1 will be the same as that by method 2 in that the end studs and bottom plate are assembled, the gable stud is marked off and attached, and the rafter (top plate) is nailed on to form a rectangle after this frame has been trued up for square. The rafter and bottom plate are carefully marked off for intermediate studs at the specified centres by use of a straight-edge parallel to the end studs. Intermediate studs can then be marked off and cut individually.

Before any wall plates are nailed to the floor joists the level of the joists in relation to each other should be checked with a straight-edge; otherwise any variation will be carried through to the top plate. If the joists have been well laid, no difficulty will be experienced, but if any time elapses between the laying of the joists and the construction of the framework, a check is advisable, as warping due to weathering may have occurred.

If method 2 is used for wall framing construction, straight framing is relatively simple, the top and bottom plates being mated before erection and full-length studs nailed in. The Standard Code makes certain recommendations regarding the checking of plates to ensure uniformity of thickness and squareness (that is, to remove any mill sawing discrepancies). Any work of this nature should be done to both plates while they are being mated.

The position and spacing of studs in the frame are determined by local by-law and the dimensions of internal and/or external sheathing materials. Full-length studs are positioned by openings for doors and windows.

The recommendations of the Standard Code concerning size and spacing of studs are given in Table 2.

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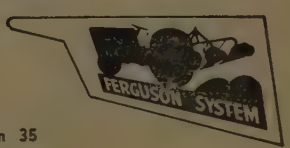

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TABLE 2—MINIMUM SIZES AND MAXIMUM SPACING OF STUDS FOR EXTERNAL WALLS AND BEARING PARTITIONS

Situation of studs	Size and spacing of studs			
	For studs not exceeding 9ft. high		For studs exceeding 9ft. but not exceeding 12ft. high	
	Width x thickness	Maximum spacing	Width x thickness	Maximum spacing
Single storey building .. or Top storey of a building more than one storey high ..	4 x 2 or 4 x 1½	20 16	4 x 2	20 —

Careful checking with the joinery manufacturers will ensure that no error is made in positioning full-length studs which act as posts for door frames and windows. These studs should be approximately 1in. wider apart than the outside dimensions of the door and window frames. This permits of variation in fitting and allows discrepancies to be compensated for by packing.

Lintels

Lintels for doors and windows must be proportioned in depth to suit the span. The Standard Code's recommendations in this respect are given in Table 2. Solid lintels may be checked into the full-length studs for short spans, but for wide spans it is good practice to provide a trimmer stud to support the lintel as shown in Fig. 10. Allowance for this should be made when marking off plates for the position of full-length studs.

Jack studs above lintels and under windowsill plates are best marked off and fitted individually to ensure good fitting. The Standard Code also gives recommendations regarding lintels (see Table 3).

Bracing

Bracing gives that rigidity or stiffness to a timber frame structure which is an insurance against cracks, sticking doors and windows, and general movement. In districts subject to high winds or earthquakes reliance must be placed on bracing to maintain the shape of the structure under adverse conditions.

Two methods of bracing can be employed and each has its application. The Standard Code can be quoted in this respect as follows:—

"All corners of exterior walls shall be braced in a horizontal plane at the top ceiling level with timbers running diagonally not less than 6in. x 1in. firmly spiked at each end to the plates and to each joist. This bracing shall extend between points distant not less than 6ft. from the corner along each wall.

"Each exterior wall and each bearing partition wall and all other partitions which are necessary to give each exterior wall or bearing partition lateral supports not more than 20ft. apart shall be securely braced [in accordance with Table 4].

"Wherever possible in two- or three-storey buildings one brace in each major wall shall continue from the bottom plate to the top of the wall. Such braces shall not be joined within 6ft. of intermediate floor levels.

"Braces checked into studs shall be checked flush with the surface of studs and into all plates and shall be fixed at an angle of approximately 45 degrees to the horizontal. Provided that the checking shall not reduce the minimum width of stud required [Table 4] by more than 1in.

"Braces cut between studs shall be in continuous alignment and in full face contact with studs at both ends and shall be securely fixed with not fewer than two 2½in. nails.

"Where studs are covered either inside or outside with diagonal timber not less than ¾in. thick and securely nailed to all studs other bracing may be omitted.

"Provided that when this is done in two- or three-storey buildings not more than one half of the covering timber may be joined at an intermediate floor level.

"Where openings or other peculiarities of a structure render normal bracing inadequate or impossible special precautions shall be taken to ensure to the satisfaction of the Engineer that the stability of the building will be in accordance with the requirements of local by-laws."

Braces can therefore be either checked into studs or cut between studs; both types are shown in Fig. 11, and Fig. 12 illustrates the theory of bracing.

The theory of bracing for timber framed structures is not too complex for the layman to grasp after a little

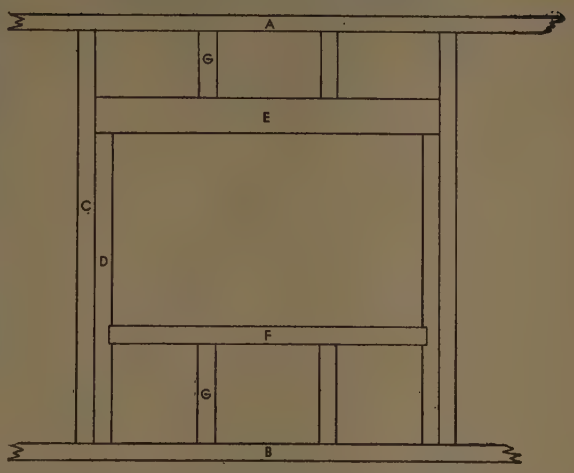

Fig. 10—The placing of trimmer studs to support a lintel. A—Top plate. B—Bottom plate. C—Full-length studs. D—Trimmer studs. E—Lintel. F—Sill plate. G—Jack studs.

TABLE 3—DEPTH OF LINTELS TO OPENINGS

Width of opening	Minimum depth of lintels	
	Solid	Built-up
	in.	in.
Not exceeding 4ft. 6in.	3	6
Over 4ft. 6in. but not exceeding 6ft. ..	4	6
Over 6ft. but not exceeding 7ft. 6in.	5	8
Over 7ft. 6in. but not exceeding 9ft. ..	6	8

All openings more than 9ft.-wide shall be trussed or provided with adequate lintels to the approval of the Engineer. Such lintels shall have not less than 2in. solid bearing at each end and their dimensions shall be specially computed.

The dimensions of all lintels carrying the load from floor joists shall be specially computed to the satisfaction of the Engineer.

TABLE 4—BRACES FOR WALLS, BEARING PARTITIONS, AND PARTITIONS USED FOR LATERAL SUPPORT OF WALLS

Storey in building	Size of braces		Number of braces required according to length of wall or partition		
	Checked into studs; width by thickness	Cut between studs; width by thickness	Not longer than 15ft.	Longer than 15ft., but not longer than 35ft.	Longer than 35ft.
	in.	in.			
Single-storey building or top storey of a building more than one storey high ..	4 x 1	3 x 2	1	2	Two, plus one for each 25ft. in excess of 35ft. and for any further excess not exceeding 25ft.

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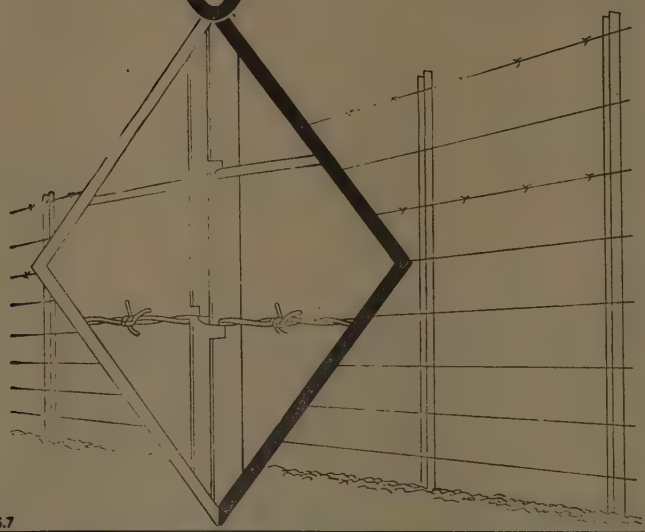

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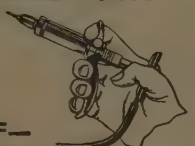

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thought. It was stated in the first part of this series that "though the forces imposed on the structure of a building are not all vertical, their transmission to the soil through the foundation is arranged by structural design to result in a vertical plane". The braces in a structure are the members which are provided to change the direction of any forces set up by wind pressure or other causes from the horizontal to the vertical plane. If this fact is remembered, the placing of bracing becomes relatively simple.

A brace can be either in tension or compression according to whether it is inclined toward or away from the horizontal forces imposed on it. With two braces in opposition one will be in tension while the other is in compression when subjected to the same forces. A brace checked into studs is a more satisfactory member in compression than a brace cut between studs. A checked brace can offer some resistance to tension, but a brace cut between studs is not suitable for tension loading.

In timber frame construction braces for external walls should never be regarded as tension members, the countering of horizontal forces from any direction being done by the provision of compression braces; that is, the inclination of braces in any one wall must be such as to resist the horizontal forces from any direction by compression only.

Lateral bracing for outside walls which may be subject to some tension (as compression forces must be countered by ceiling joist ties to the opposite wall) should be checked braces. Others may be cut between studs.

Though they entail more labour, checked braces are easier for the layman to fit, as braces cut between studs require very careful cutting to ensure "full face contact at both ends".

Fig. 1 shows that braces must be provided on the outside wall of the fertiliser store along the full length of the back wall and on the outside wall of the implement shed. Knee braces are provided on the trussed rafters over pillars.

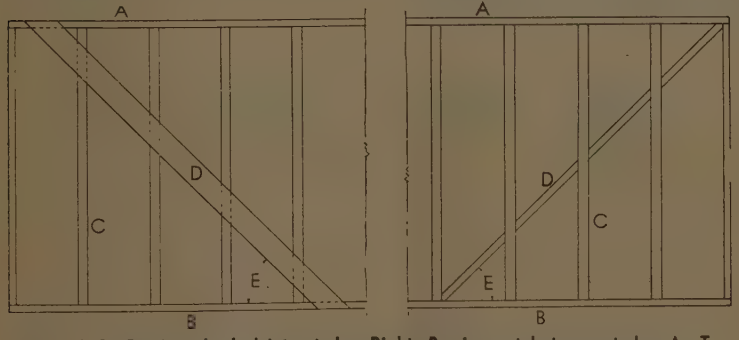

Fig. 11—Left: Bracing checked into studs. Right: Bracing cut between studs. A—Top plate. B—Bottom plate. C—Studs. D—Brace. E—Approximately 45 degrees.

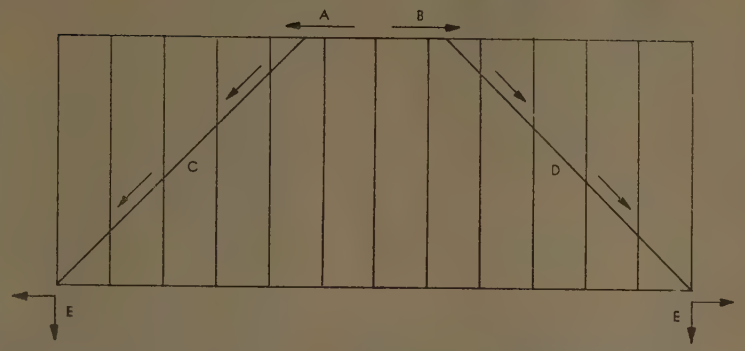

Fig. 12—Change of direction of forces by bracing. Arrows indicate direction of forces. A and B are horizontal forces; A is transmitted through brace C, resulting in components E on foundations. Force B acts similarly through brace D. Force A exerts compression on C and tension on D.

The Roof

The Standard Code states:—

"All roofs shall be so framed and tied into the framework and supporting walls as to form an integral part of the whole building.

"Roofs of all buildings shall be sloped so that they will drain to gutters and downpipes and shall have a pitch to suit the roofing material being used."

Roof construction on a timber frame building may be of two types:—

1. The supported span roof, in which the weight can be carried on internal bearing partitions.

2. The trussed span roof, where the weight is carried by the outside walls only which support the ends of the truss.

The first type is used for dwellings where internal partitions, which divide the building into rooms, can be built strong enough to carry any weight superimposed by the roof. The Standard Code recommendations refer to this type of construction and are as follows:—

"939 (a) The spacing of rafters, and the span of various sizes of rafters, shall not be greater than shown [in Table 5].

"(b) For the purposes of this clause any roof with a slope of less than 1 in 6 shall be considered a flat roof and any roof with a slope of 1 in 6 or more than 1 in 6 shall be considered a pitched roof.

"(c) Rafters shall be well spiked to the plates, ridge boards, valleys, and hips.

"(d) Rafters shall be efficiently trussed or shall be strutted with not less than 3in. x 2in. timbers from the top of the bearing or partition walls. If 10ft. or over in length, rafters shall in addition have collar ties not less than 6 sq. in. in cross-section to every third pair of rafters:

"Provided that in no case shall the collar ties be more than 6ft. apart. If less than 10ft. in length, rafters shall have connecting cleats below the ridge similarly spaced.

"940. Purlins shall be not less than 3in. x 2in. in size. When supporting corrugated iron they shall be spaced at not more than 2ft. 6in. for 26 S.W.G. and not more than 3ft. for 24 S.W.G. sheets. When supporting corrugated asbestos-cement sheets they shall be spaced in accordance with the New Zealand Standard Specification (N.Z.S.S. 282) for Asbestos-cement Unreinforced Flat Sheets and Corrugated Sheets.

"941. Hips, valleys, and ridges shall be 2in. greater in depth than the rafters attached to them. Hips and ridges shall be at least 1in. in thickness and valleys shall be at least 1¼in. in thickness. Any joints shall be spliced on each side with pieces 1in. thick, of equal width, and 3ft. long. Laminated constructions shall be permitted.

"942. (a) Ceiling joists shall be not less than the equivalent in strength of 4in. x 2in. timbers on edge spaced at 20in. centre to centre. Ceiling joists exceeding 8ft. in clear span shall be secured by runners in the centre of

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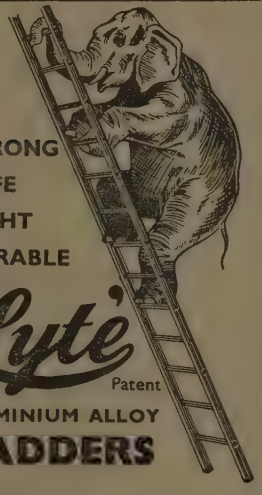

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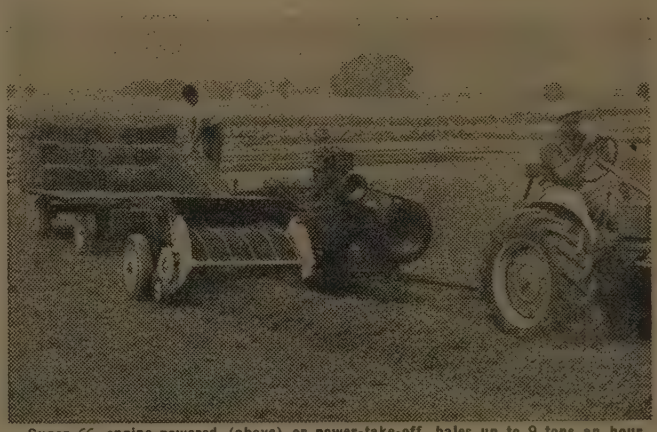

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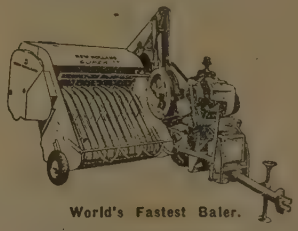

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J — 3

TABLE 5—MAXIMUM SPAN FOR VARIOUS SIZES OF ROOF RAFTERS

Type of roof	Roof covering*	Minimum support for roofing material	Maximum spacing of centre to centre rafters	Maximum span for various sizes of rafters								
				3in. x 2in.	4in. x 2in.	5in. x 2in.	6in. x 2in.	7in. x 2in.	8in. x 2in.	9in. x 2in.	10in. x 2in.	12in. x 2in.
Pitched roofs	T.S.	2in. x 1in. battens	18	ft. in. Nil	ft. in. 8 0	ft. in. 10 0	ft. in. 12 0	—	—	—	—	—
	C.S.I.A.; and F.S.M. C.S.I.A.	1in. sarking	20	6 0	8 6	10 6	13 0	—	—	—	—	—
		3in. x 2in. purlins	36	5 0	7 0	8 6	10 6	—	—	—	—	—
Flat roofs without access	C.S.I.A.; and F.S.M. C.S.I.A.	1in. sarking	20	5 6	7 6	9 6	11 6	13 6	15 6	—	—	—
		3in. x 2in. purlins	36	Nil	6 0	7 9	9 3	10 9	12 3	—	—	—
Flat roofs with access	F.S.M.	1in. sarking	18	Nil	6 0	7 9	9 3	10 9	12 3	14 0	15 6	19 0
Pitches or flat roofs without access in outbuildings only†	C.S.I.A.; and F.S.M. C.S.I.A.	1in. sarking	20	6 0	9 0	12 0	14 0	—	—	—	—	—
		3in. x 2in. purlins	36	5 0	8 0	10 0	12 0	—	—	—	—	—

* T.S. denotes tiles or slates, C.S.I.A. corrugated sheets of iron or asbestos, F.S.M. fabric or sheet metal.
† Applies only to outhouses not exceeding 10ft. in height or 200 sq. ft. in base area. Outhouses roofed with tiles or slates or with a flat roof with access shall comply with the requirements for pitched roofs and flat roofs with access.

the span properly nailed at each crossing. Ceiling joists exceeding 16ft. in clear span shall have two such runners and shall, in addition, be secured to the roof timbers in such a manner as to reduce the transmission of vibration to a minimum.

"(b) Ceiling joists when supported on a ribbon board shall be double nailed to the studs.

"(c) Ceiling joists shall form a continuous tie. Where required by the Engineer runners shall be fixed across the joists to provide a similar tie.

"943. Roof framing and trussing shall be thoroughly and effectively diagonally braced. In hip roofs of small span hips may, with the permission of the Engineer, be used instead of braces."

Examples of the supported span roof and the trussed span roof are shown in Figs. 13 and 14.

Construction of Beam and Posts

The beam and posts supporting the roof of the implement shed shown in Fig. 1 are laminated, the beam consisting of two 10in. x 3in. timbers with 6in. by 2in. braces bolted between them. Additional bolts are placed in the spans between pillars, and before the holes are drilled 2in. packing pieces must be placed between the 10in. x 3in. timbers and the holes to accommodate the bolts drilled right through the three timbers.

The post carrying this beam at the fertiliser store end consists of two 4in. x 3in. timbers with a 4in. x 2in. sandwiched between and carried up between the beam members. The post at the other end is a replica of the intermediate posts, details of which are shown.

The roof construction over the implement shed consists of trussed rafters of the design shown in Fig. 14.

All major joints in the trusses are bolted. In this construction timber connecters can be used to advantage, particularly with softwoods such as pine.

To allow head room in the fertiliser store the rafter span is supported on two 8in. x 3in. bearers set on walings checked into the studs of the side walls. This gives a supported span roof as shown in Fig. 13, the struts being omitted and the bearers (or under purlins) being increased in section accordingly.

FRAMING OF STRUCTURES

Supported Span Roofs

After the framing of the building has been constructed up to the top plate the construction of a gable roof framework consists of placing and nailing ceiling joists and erecting the gabled framework with these joists as a foundation or base.

Joists should be so placed that they can be nailed to the rafters as well as to the top plate to act as base ties for the rafters to counter the outward thrust caused by downward pressure of the roof. If this cannot be done for

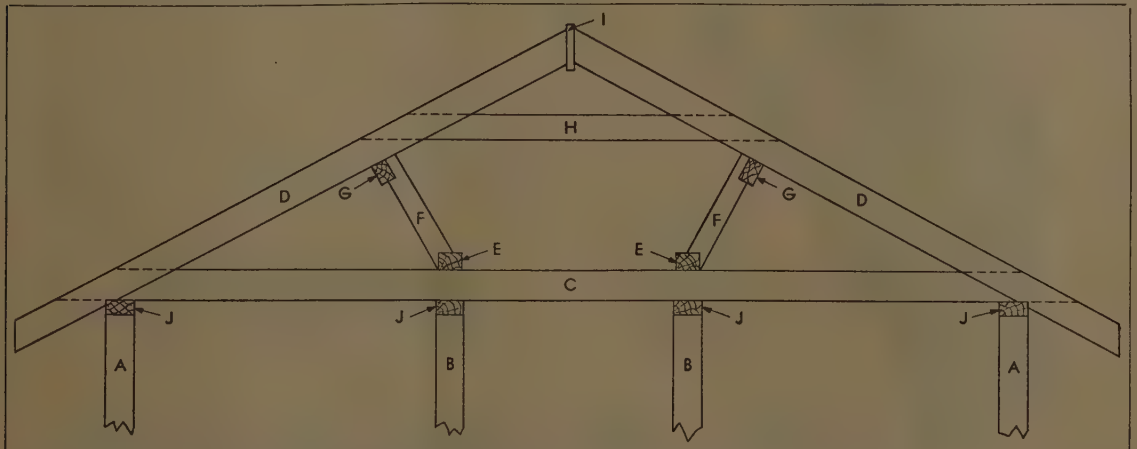

Fig. 13—Supported span roof section. A—Outside wall studs. B—Internal bearing partition studs. C—Ceiling joist. E—Runners. F—Struts. G—Under purlins. H—Collar tie. I—Ridge board. J—Wall plates.

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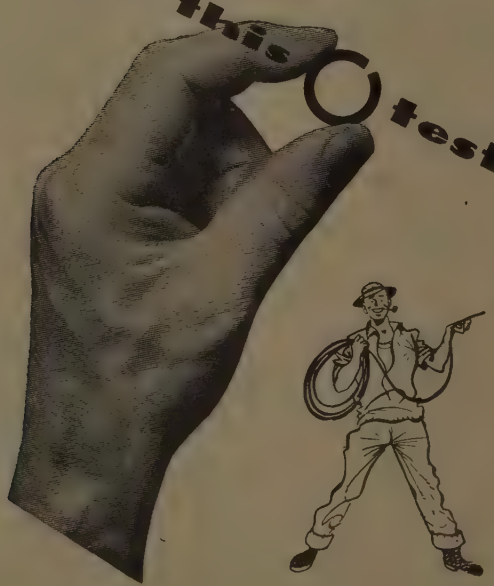

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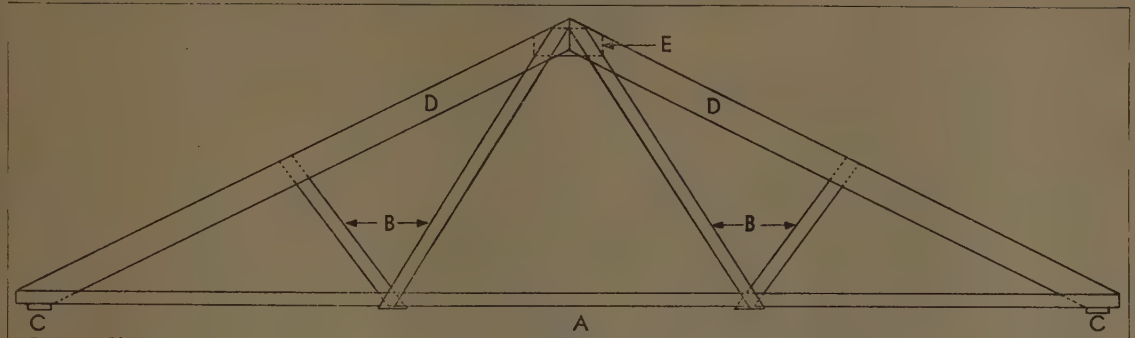

Fig. 14—Clear span trussed rafter. A—Lower member or ceiling joist. B—Struts. C—Wall plates. D—Rafters. E—Splice plate (dotted).

every pair of rafters, it should at least be applied to every third pair.

Procedure of erection of a supported span roof is as follows:—

With 4in. x 2in. rafters a template should be cut from 4in. x 1in. timber for the full-length rafters as shown in Fig. 15. For a gabled roof these will be used for the full length of the building provided the roof edge is in the same plane and no dormers intrude.

Measurements and angles for cutting this template can be taken from the drawings, which will show a sectional elevation of the building. The template should be made longer than the finished length of the rafters as shown on the drawing to permit rafter ends to be cut to correct angle for barge boards after roof framing is completed.

Four rafters should be cut to the template and lightly nailed in their permanent position with the ridge board in place. The ridge board may have to be supported temporarily while the rafters are being placed. However, if two opposite rafters are placed and nailed together no difficulty will be experienced in positioning them correctly. These rafters and ridge board form the initial support on which the rest of the roof is framed.

All rafters must be cut to the template to ensure that they are all identical in length between the check for the plate and the ridge board face as shown in Fig. 15. If the wall has been carefully framed and the top plates are parallel, the ridge board will naturally be level if all the rafters are of identical length. The placing of these initial rafters should preferably be at the ends of a length of ridge board, allowance being made for any splicing of the ridge board.

For full gabled roofs one end of the ridge board will be vertically over the end wall and the rafters can form the end rafters of the building. For hipped roofs these full-length rafters will be at a distance from the end of the building to suit the hip slope.

These four rafters and ridge board form the nucleus of the whole roof framing on which the remainder of the roof can be built.

No difficulty should be experienced in fitting intermediate rafters for a gable roof; hip roofs require some marking off technique to enable cutting of jack rafters to be done accurately.

Jack rafters to valleys or hips become shorter as they approach the ridge board in valleys or the roof edge in hips. In all other respects they are identical, being cut on a double angle where they join either the valley or hip ridge board.

The best method of marking this double angle is to take the angles off the members already in place with a "bevel" and transfer them to a template for cutting. The template should be tried for fit before any jack rafters are cut and if satisfactory all jack rafters can be marked off and cut from the template or adjustments made as required.

Trussed Span Roofs

To ensure a reasonable margin of safety for buildings constructed with trussed span roofs it is preferable for truss designs for particular buildings to be prepared to suit requirements. Such details as bracing, anchorage, columns and walls, roofing material, etc., are too variable to permit standard designs of trusses for varying spans to be prepared. However, some typical designs can be given calculated for a fixed loading (that is, corrugated iron roofing). The over-all dimensions of these designs can be increased or decreased within limits without reducing the member sizes provided the total design load is not increased.

The total design load of a truss is the span multiplied by the spacing multiplied by the design load per square foot. Within reasonable limits any of these three items may be changed provided the resultant total load is the same or less.

Framing Corners or Junctions

If the framing of the walls of a building up to the top plate is being

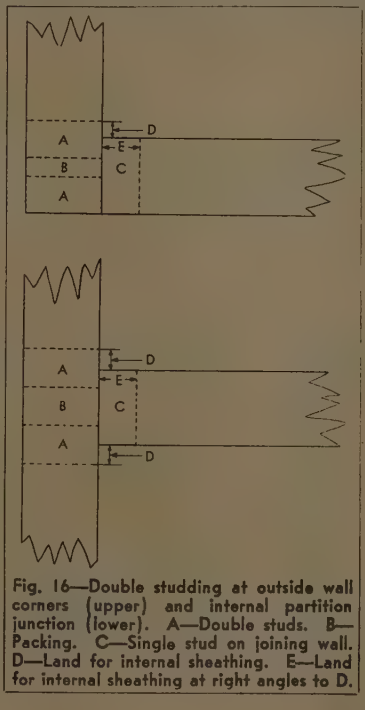

Fig. 16—Double studding at outside wall corners (upper) and internal partition junction (lower). A—Double studs. B—Packing. C—Single stud on joining wall. D—Land for internal sheathing. E—Land for internal sheathing at right angles to D.

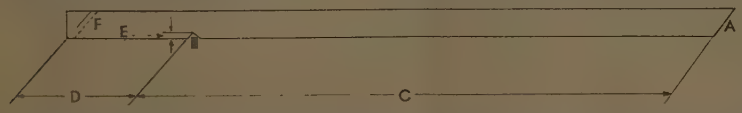

Fig. 15—Rafter template. A—Ridge board face. B—Check for plate. C—Parallel faces. D—Overhang for eaves (to be cut in place at F). E—Not more than quarter depth of rafter.

carried out as described, the amateur builder may find difficulty in framing a corner satisfactorily. The framing acts as the support for both the internal and external sheathing, and a sufficient land must be provided in two directions at corners to which the sheathing can be securely nailed.

Extra studs must therefore be provided which, though not being essential framing members, give land for internal sheathing in one direction, and if securely nailed, form a rigid box section corner.

Where walls are framed in accordance with method 1 on page 467 the end studs for one wall can be doubled as shown in Fig. 16 and the end stud of the other wall nailed through both end studs on erection.

If method 2 is used, the placing of the extra end stud presents no difficulty.

This method of double studding, though less economical in the use of timber, produces a far stronger member at the corners, which are the points of weakness in any structure. The same principle can be applied where internal partition walls are attached to outside framing as shown in Fig. 16.

Meteorological Records for March

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	65.8	+ 2.0	83.0	44.1	6.80	15	+ 2.62	4.46	8	201
Auckland	160	67.6	+ 2.7	80.8	52.2	2.51	14	— 0.64	0.63	9	195
Tauranga	10	65.0	+ 2.4	81.4	44.4	8.25	18	+ 4.15	3.19	9	181
Ruakura	131	64.0	+ 2.8	81.9	42.6	5.11	12	+ 2.13	2.30	9	169
Rotorua	975	62.8	+ 2.3	82.1	40.5	7.45	14	+ 3.58	2.61	18	151
Gisborne	12	64.0	+ 2.0	81.6	43.2	5.37	20	+ 1.67	1.23	13	165
New Plymouth ..	160	64.1	+ 3.1	78.8	48.0	6.41	10	+ 2.67	2.38	18	220
Kariol	2125	58.4	+ 3.3	79.9	36.9	4.80	16	+ 2.46	0.92	19	
Napier	5	65.3	+ 2.9	79.9	45.8	1.45	12	— 1.13	0.31	17	191
Wanganui	72	64.8	+ 3.2	80.3	48.1	1.94	7	— 0.21	0.78	18 19	204
Palmerston North ..	110	64.9	+ 4.6	81.0	45.0	2.57	11	+ 0.34	0.84	19	202
Waingawa	340	62.8	+ 3.8	86.5	37.9	4.06	16	+ 1.86	0.60	7	188
Wellington	415	63.7	+ 4.3	77.9	49.2	2.37	13	— 0.81	0.67	18	203
Nelson airfield ..	5	62.6	+ 4.2	77.0	45.1	2.37	13	— 0.32	0.59	29	192
Blenheim	12	63.6	+ 3.7	82.0	43.7	3.48	12	+ 1.95	0.94	29	200
Hokitika	15	60.0	+ 3.7	79.2	39.0	8.33	19	— 0.61	3.35	19	144
Hanmer	1270	58.4	+ 2.2	88.5	88.0	5.57	13	+ 2.21	1.52	10	160
Christchurch ..	22	61.6	+ 3.5	74.9	40.2	5.60	13	+ 3.66	2.20	10	161
Ashburton	323	61.6	+ 3.8	90.5	40.0	6.57	16	+ 4.37	1.32	6	156
Timaru	56	60.0	+ 2.6	76.4	40.8	5.97	18	+ 3.84	1.47	19	127
Alexandra	520	60.3	+ 2.7	87.5	33.5	3.45	14	+ 2.30	0.68	18	146
Taieri	80	57.9	+ 2.7	81.7	31.8	5.01	15	+ 2.94	1.32	19	138
Invercargill airfield ..	0	56.5	+ 2.7	76.9	32.8	2.58	13	— 1.45	0.80	18	110
Chatham Islands ..	140	60.2	+ 3.8	69.2	44.3	2.84	16	+ 0.28	0.54	15	

Grading Points for Export Butter and Cheese

BUTTER-MANUFACTURING companies which obtained an average grade of 93.75 points or more and cheese-manufacturing companies which obtained an average grade of 92.50 points or more during the year ended 31 July 1956 are listed below in order of merit. Of the total listed the 23 butter factories and 11 of the cheese factories are in the North Island and the remaining 3 cheese factories are in the South Island. The production figures are for the balance-sheet year 1955-56 and the graded for export figures are for the period 1 August 1955 to 31 July 1956.

Creamery Butter

Factory	Registered number	Brand	Production tons	Graded for export tons	Average grade points	Grading port
Wairoa ..	1,315	Wairoa ..	555	70	94.399	Hastings
Taihape ..	1,188	Tikapu ..	197	70	94.357	Castlecliff
United ..	1,296	Wharitl ..	680	162	94.278	Wellington
Cheltenham ..	3	Pakeha ..	1,488	768	94.179	Wellington
Konini ..	1,203	Konini ..	1,573	779	94.082	Wellington
N.Z. Dairy (Morrinsville)	415	Anchor ..	3,384	3,383	94.078	Auckland
Te Aroha-Thames Valley ..	344	Overseas ..	4,045	3,410	94.070	Auckland
Wangaehu ..	1,326	Wangaehu ..	576	410	94.044	Castlecliff
N.Z. Dairy (Ngatea) ..	291	Anchor ..	2,690	2,625	94.028	Auckland
Kuku-Manakau	905	Ohau ..	538	374	94.023	Wellington
Levin ..	910	Lake ..	1,846	728	93.999	Wellington
Cambridge ..	1,239	Cambridge ..	3,285	738	93.953	Auckland
Te Awamutu ..	397	Lotus ..	2,620	2,075	93.922	Auckland
N.Z. Dairy (Taupiri) ..	22	Anchor ..	4,873	3,661	93.914	Auckland
Rangitikei ..	1,360	Rangitikei ..	984	629	93.897	Castlecliff
Awahuri ..	664	Red Rose ..	1,367	516	93.876	Wellington
Moa Farmers'	341	Inglewood ..	2,242	1,614	93.865	New Plymouth
N.Z. Dairy (Frankton)	1,510	Anchor ..	5,979	3,014	93.843	Auckland
Okitu ..	1,270	Okitu ..	143	74	93.826	Gisborne
Mangorei ..	345	Mangorei ..	1,277	1,039	93.791	New Plymouth
N.Z. Dairy (Paerata) ..	109	Anchor ..	2,182	1,945	93.776	Auckland
Kia Ora ..	926	Kia Ora ..	865	339	93.775	Gisborne
Mercury Bay	485	Mercury Bay	902	870	93.762	Auckland

Cheese

Factory	Registered number	Brand	Production tons	Graded for export tons	Average grade points	Grading port
Dalefield ..	9	Dalefield ..	1,318	1,308	92.853	Wellington
Alton ..	1,890	Alton ..	900	902	92.810	Patea
Seaward Downs ..	702	Seaward Downs ..	491	494	92.670	Bluff
Wright's Bush	206	Wright's Bush ..	163	164	92.668	Bluff
Greytown-Wairarapa ..	529	Greytown ..	877	810	92.661	Wellington
Waitohi ..	483	Waitohi ..	285	85	92.616	Wellington
Mells ..	764	Mells ..	647	640	92.607	Patea
Awatuna ..	60	Awatuna ..	1,019	1,011	92.599	New Plymouth
Thornbury ..	1,581	Thornbury ..	232	234	92.580	Bluff
Westmere ..	1,621	Westmere ..	482	479	92.544	Castlecliff
Featherston ..	360	Featherston ..	1,759	1,652	92.534	Wellington
Parkvale ..	1,240	Parkvale ..	532	524	92.523	Wellington
Manutahi ..	495	Manutahi ..	642	644	92.511	Patea
N.Z. Dairy (Waihi) ..	144	Anchor ..	1,106	1,011	92.509	Auckland

Butter companies whose butter was graded mainly for the local market and for which an average grade of 93.75 points or more was obtained for the combined local and export gradings were as follows:—

Murchison ..	1,888	Airship ..	480	357	94.269	Lyttelton
Westland ..	145	Westland ..	779	580	94.241	Lyttelton
Kaikoura ..	302	Kai ..	647	468	94.238	Lyttelton
Karamea ..	1,570	Karamea ..	416	320	94.199	Lyttelton
Golden Bay ..	146	Sovereign ..	1,011	901	94.187	Lyttelton
Inter-Wanganui	6	Inter-Wanganui	462	302	94.067	Lyttelton
Collingwood ..	1,254	Golden Hills	518	496	93.875	Lyttelton

Peat Blocks for Raising Tomato Seedlings

By H. A. BROWNING,
Research Officer,
Department of Agriculture's Rukuhia Soil Research Station, Hamilton

THE use of loam blocks for raising tomato seedlings is now established practice in New Zealand. The use of peat for this purpose has possibilities and since there are unknown factors in its application, research on the subject was initiated at the Department of Agriculture's Rukuhia Soil Research Station in the winter of 1955.

SOME factors which commend peat in the form of compressed blocks for seedling growth are:—

1. In many districts peat can be obtained in unlimited quantities and could be sold without detriment to valuable land.

2. It can be obtained of consistent quality.

3. It is a valuable additive to most soils.

4. It does not need sterilising if in the raw state.

5. It is easy to handle at any moisture content.

6. Damp, raw, fibrous peat is very permeable to moisture.

7. Blocks will not disintegrate and when dry are light and easily transported and stored.

Fertility Level

The main problem in the use of peat is that the fertility level required in terms of added soil nutrients is unknown. The John Innes Horticultural Institute in England has published formulas for potting soil mixtures and expressed their components of lime and fertilisers as ounces per bushel of potting soil.

Thus from a standard base fertiliser mixture consisting of 2 parts of nitrogen as hoof and horn (dried blood in New Zealand), 2 parts of phosphate as superphosphate, and 1 part of potash as sulphate of potash, 4oz. are incorporated with 1 bushel of potting soil (loam, 7 parts; peat, 3 parts; and sand, 2 parts).

Different multiples of this basal dressing per bushel of potting soil are recommended for different crops, and 3 times this amount is recommended for tomatoes.

The levels of nitrogen, phosphate, and potash used in the Rukuhia experiments are expressed as multiples of the fertiliser ingredients of a base mixture similar to the John Innes base mixture recommended for potting soils.

Tomato seedlings in peat blocks.

It was decided to use raw, fibrous peat from the Moanatuatua swamp, and as no difficulty was experienced in making blocks of any size or shape, a convenient form was selected and a jig was made to mould square blocks measuring 4in. x 4in. x 3in. deep.

To obviate difficulties in establishing seedlings at the pricking out stage and to eliminate any possible deficiencies in minor elements a conical depression was formed in the surface of each block. This was filled with potting soil to the John Innes specification for potting mixture as recommended for tomatoes.

Lime

On the recommendation of soil chemists who have established levels of lime requirements for peat in this district finely ground limestone at 6oz. per bushel was incorporated with the peat, and pH tests showed this should be a satisfactory level.

The available soil nutrients in raw peat are negligible and higher rates should be needed than those recommended for potting soils. So levels of 4, 6, and 8 times the standard base values of phosphate and potash were combined with treatments including 4, 6, and 8 times the nitrogen in the standard base in all combinations.

Fertilisers

Fertilisers used were superphosphate, sulphate of potash, and sulphate of ammonia. Fertiliser and lime were incorporated with the peat before the blocks were made. Tomato seedlings of the Potentate variety were pricked out into blocks at the end of August. Moisture and light conditions in the glasshouse were maintained at the same level for all treatments and nutrients were not allowed to leach away.

Growth of Plants

All plants grew to the flowering stage in the space of 7 weeks from pricking out, which is about the time taken by ordinary seedlings pricked out in boxes to reach the planting-out stage.

At this stage dark green foliage, stunted growth, and thick stems, symptoms of nitrogen toxicity, were evident in high nitrogen treatments. Differences in growth and colour were very marked. Greatest growth was found with the lower levels of phosphate, potash, and nitrogen.

Soil tests of blocks revealed concentrations of salts that were far too high and there was general evidence of root burning. Analysis of leaf samples showed results that are consistent with high salt concentration.

It is not possible to state what should be the appearance of the ideal plant for planting out, and yield is the best criterion. This experiment was not carried through to the yield stage, because root burn already showed that the application of fertiliser was not ideal.

PEAT BLOCKS . . .

A robust, well-balanced plant was grown with the "medium" treatment of all ingredients, but the presence of root burn cannot be said to indicate the ideal treatment. However, all seedlings that were later planted out with the blocks grew well and were producing good crops before Christmas. It is probable that any lack of balance in nutrient status corrects itself after planting out with the expanding root system. Some blocks containing stunted plants were never planted and remained on the surface of the soil in open frames. These survived the summer under very dry conditions.

Moisture Level Trial

Concurrently with this experiment a trial of various moisture levels on tomato blocks containing the medium treatment of fertiliser showed small differences and a remarkable range of tolerance. Water was applied to the blocks only and the foliage of the plants was never wetted during the trial.

Second Trial

A second pair of trials raising the same variety of tomato seedlings in blocks was laid down in summer. The first compared lower levels of nutrients than in the first trial. Treatments consisted of the fertiliser base in multiples of 1, 2, 3, and 4 for phosphate and potash in all combinations with the corresponding 4 levels of nitrogen. The same fertilisers were used as in the first trial.

Differences due to treatments were not so marked as in the first trial, but the lower rates of nitrogen showed to advantage, highest nitrogen treatments producing stunted growth with dark foliage as did the high nitrogen treatments in the first trial in spring.

The second trial compared sulphate of ammonia with dried blood at equivalent rates of nitrogen at 3 levels.

High rates of blood were not as good as low rates, but did not cause so much stunting as sulphate of ammonia.

This series of trials is being continued this season in search of the best fertiliser treatment, but in the meantime it seems safe to state that good results with peat blocks for tomatoes should be obtained with a lime application of 6oz. per bushel of shredded peat and 8oz. to 16oz. per bushel of a mixture consisting of 2 parts of dried blood, 2 parts of superphosphate, and 1 part of sulphate of potash.

It is certain that the ability to plant out at a much more advanced stage without a setback to the plant and the chance to delay planting out if the weather is not suitable are advantages that should recommend peat blocks for raising tomato seedlings to commercial and private growers alike.

"Life and Work at Canterbury Agricultural College"

THIS book, compiled by I. D. Blair, shows that the first 50 years of College life and work differed very much from the subsequent 25 years. In the first period training was based on the work of a large arable mixed farm and was kept strictly within that sphere. College thought over this period never deviated from the conception that the best basic training for any type of farming was a thorough knowledge of the science and practice of arable mixed farming, and roll numbers were kept within the scope of the training facilities available. Gradually the College widened its teaching and expanded its roll and during the past 25 years has grown into a large and modern agricultural college.

The story of the life and work of the College over its 75 years has been conscientiously dealt with. The book will be of great interest to students of the College, for they can view the story against a known background of experience. Others, though finding in it a useful account of the work and achievements of the College, may be puzzled at the space devoted to apparently trivial details. The steam traction engine for instance assumes almost equal importance to the leading personalities of the institution, and so it did to the students residing at the College for the first three decades of the present century. No medal or reward which the College gave was equal in the eyes of the students to the prestige of a certificate entitling ". . . the holder thereof to drive and have charge of any steam traction engine". Even Hilgendorf's D.Sc. was to many students of less importance than the fact that he had a "ticket". This attitude was, however, merely a reflection of student desire to attain proficiency in all the skilled practical work of arable mixed farming.

The problems and progress of instruction at the College might have been made clearer if the book had given a more connected thread of comment relating the voluminous anecdotes to the work of instruction at both professional and practical levels. No doubt experience over 75 years has been used to mould the present College courses, and detailed comment on experience in teaching the science and practice of farming to students in classes of varying previous experiences and education would be most helpful to persons interested in agricultural education.

—*P.W.S.*

The Caxton Press, Christchurch. 30s.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during February 1957 and for the 7 months ended 28 February 1957 with comparative figures for the same month and 7 months of 1955-56 have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Period	Creamery (tons)	Whey (tons)	Total (tons)	Percentage Inc. or dec.
February 1957	13,033	298	13,331	—
February 1956	16,714	320	17,034	—
Increase or decrease	—3,681	—22	—3,703	—21.739
7 months ended 28/2/57	130,015	2,261	132,276	—
7 months ended 28/2/56	135,382	2,304	137,686	—
Increase or decrease	—5,367	—43	—5,410	—3.929

Butter in store at 28 February 1957 was 28,753 tons.

CHEESE

Period	White (tons)	Coloured (tons)	Total (tons)	Percentage Inc. or dec.
February 1957	8,909	944	9,853	—
February 1956	8,083	1,744	9,827	—
Increase or decrease	+826	—800	+26	+0.264
7 months ended 28/2/57	61,036	8,398	69,434	—
7 months ended 28/2/56	59,777	10,182	69,959	—
Increase or decrease	+1,259	—1,784	—525	—0.750

Cheese in store at 28 February 1957 was 23,728 tons.

If these figures are converted into butterfat equivalent, there is a decrease of 3.393 per cent. in butterfat graded for the 7 months as compared with the corresponding period of the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time they are not necessarily a true indication of production trends.

Recent Research Work

IRRIGATION AND NITROGEN LEVELS

THE effect of irrigation on nitrogen levels in soil and plant is being studied at the Department of Agriculture's Winchmore Irrigation Research Station, where it has been found that annual crops and pastures are affected in different ways.

ANNUAL CROPS

UNDER irrigation it would be expected that there would be a tendency for nitrate nitrogen to be leached from the soil, since this form of nitrogen is readily water soluble. The soil type on which most irrigation is carried out in Mid-Canterbury is fairly permeable to water, and any plant nutrients leached out of the soil would be completely lost. In addition, because of this permeability the amount of water used in flood irrigation is considerably more than the actual deficit, and leaching of nitrate nitrogen can occur. For example, if field crops are being irrigated to counteract a deficit of say 2in. of rainfall, about 5in. of water may be applied, that is, a drainage or leaching equivalent to that caused by about 3in. of rain in a concentrated fall.

It has been shown that under some field crop conditions there is indeed such a leaching loss, which may be up to 35 parts per million of nitrate nitrogen, or the equivalent of about ½cwt. of sulphate of ammonia per 0in. to 5in. depth of soil. Losses of this magnitude are not immediately made good by the natural break-down of organic matter in the soil to give available or nitrate nitrogen, that is, nitrification, and nitrogen deficiencies may be induced in the crop. This has been shown at the Research Station with rape and swede crops. The less fertile the soil in which the crop is grown the lower is the nitrification rate, and hence the more severe is the deficiency.

But with a soil of high fertility the nitrification rate is high enough to make good the leaching loss rapidly, and a deficiency will not result. Furrow irrigation of field crops favours high nitrification rates immediately after irrigation, and for this reason is unlikely to induce nitrogen deficiencies as does normal border dike irrigation. It may sometimes be necessary where the soil is not of good fertility to apply artificial nitrogen, preferably as sulphate of ammonia, at the early growth stage of a border dike irrigated field crop.

PASTURE

This loss of nitrate nitrogen is not evident under irrigated pasture, where the usual level of nitrate nitrogen is quite low, so that leaching, which does, of course, occur, removes only a little nitrogen. Generally, irrigated pasture has been found to build up total nitrogen and carbon levels in the soil faster than non-irrigated pasture.

At the higher moisture levels on irrigated pasture the nitrification rate of the soil is greater than at the lower moisture levels on non-irrigated pasture. For example, pasture irrigated at a 20 per cent. moisture level has a nitrification rate about twice that of non-irrigated pasture. This means that available or nitrate nitrogen is being supplied to the growing pasture twice as quickly on the irrigated area as on the non-irrigated area, giving increased pasture growth on the irrigated pasture. This enables an increased stocking rate on the irrigated pasture with a consequent greater return of fertility to the soil. This is borne out by the higher levels of organic matter and total nitrogen found in the soil under irrigated pasture.

It has been shown that as the moisture level decreases toward wilting point the nitrification rate also decreases, and therefore one of the major effects of drought conditions is a deficiency of available nitrogen or nitrate. Clovers, which have their own supply of nitrogen, are able to withstand dry conditions much more easily than grasses.

—B. D. P. WILLIAMSON

* * * *

VANADIUM

IN field trials conducted in the early 1930s a basic slag-superphosphate mixture frequently proved superior not only to superphosphate but also to basic slag. A chemical examination of this mixture showed that the elements vanadium and manganese, which are plentiful in most lines of basic slag, become more soluble when basic slag is mixed with superphosphate. Consequently, vanadium was included in field trials for the first time in 1951. Today vanadium is being used in 160 observational trials and 3 pasture measurement trials. It is usually applied at 1lb. of ammonium orthovanadate per acre.

PASTURE RESPONSES

Clear visual responses in pasture growth have occurred in a small number of observational trials north of Auckland. These trials are on two groups of soils, "semi-volcanic soils" derived from andesitic rock flows and "clay soils" derived from sandstone and greywacke. The pasture responses to vanadium on the "semi-volcanic soils", Rangiuru, Mangonui, and Whatoro clay, were mostly of a temporary, fleeting nature.

However, on the clay soils, Riponui clay and Rangiora clay, the effect of vanadium appears to be longer lasting. On two trials on Rangiora clay 1lb. of ammonium orthovanadate per acre applied in autumn 1954 is still having a clear effect on *Lotus* and white clover growth, but only where it is combined with superphosphate and 2½oz. of sodium molybdate per acre.

In one trial on Riponui clay, not duplicated, it is possible that vanadium applied at a rate equivalent to nearly 4lb. of ammonium orthovanadate per acre 1 year ago is still having a beneficial effect.

Though in this small number of observational trials the pasture responses, mainly greater vigour of clovers, appear to be clear cut, there is a need for pasture measurement trials to confirm these experiments, which are assessed only by visual observation. In the very large majority of observational trials vanadium has not stimulated growth.

Evidence from mowing trials near Dunedin on a soil which is highly molybdenum responsive indicated that vanadium cannot be used as a substitute for molybdenum. In these trials vanadium had no effect on pasture growth either with or without molybdenum.

—C. DURING

Care of Livestock during June

Contributed by the Animal Research Division

EXPERIMENTS have shown that cows fed well during winter will produce from 26lb. to 63lb. more butterfat in the following lactation than those poorly fed during winter. These results were obtained when both groups were well fed after calving. It is therefore very important to feed the cows well from now until calving so that they have ample body reserves to draw on during the first 2 months of the lactation.

WINTER FEEDING OF DAIRY COWS

It is difficult to build up these body reserves with even liberal amounts of hay and/or silage unless some grass is also available throughout the dry period. With a portion of the farm closed in autumn to save pasture for feeding after calving it is particularly important to graze the rest of the farm under a controlled rotational grazing system with adequate spelling between grazings, both to ensure continued grass growth during winter and to ration what grass is available throughout this period. Where subdivision is inadequate for this purpose break grazing with the electric fence is essential. Since cows will eat grass in preference to most other feeds, they should be fed as much hay as they will clean up in addition to 20lb. of silage per cow per day.

In areas where sheep become infested with liver fluke, flocks should be drenched now. The only effective drug is carbon tetrachloride, which should be mixed with four times its volume of liquid paraffin. The dose of the mixture is 5 c.c. for sheep of all ages, and 1 gallon is enough for about 900 sheep. Further information about liver fluke in sheep and cattle will be found in Bulletin No. 248, which is available from the nearest office of the Department of Agriculture.

LIVER FLUKE IN SHEEP

Poultry lice can cause considerable loss of condition in birds and reduced egg laying. To control these parasites a fine trickle of 40 per cent. nicotine sulphate should be run along the perches on a calm night before the birds go to roost. Two or three treatments should be given at weekly intervals.

LICE ON POULTRY

Worms are sometimes still troublesome in May and June, and if lambs or calves are not doing well, they should be drenched with phenothiazine at the full dose rates recommended by the manufacturers. Further information about worms and drenching will be found in Bulletins No. 171 and No. 189, which are obtainable from the nearest office of the Department.

WORMS IN LAMBS AND CALVES

Rickets in lambs occurs frequently during winter in Canterbury and other South Island districts. It is also occasionally seen in the North Island. Lambs wintered on green oats or barley are most susceptible, but other greenfeed or good pasture may also produce the condition. It can be prevented by giving one dose of 25 mg. of calciferol (a vitamin D concentrate) at the beginning of winter. This preparation can be purchased dissolved in olive oil with full instructions for use. Even where rickets does not occur, this treatment may induce better growth in lambs during winter. It is unlikely to be beneficial during autumn and the best time to administer it is about the end of May.

RICKETS IN LAMBS

Sows and store pigs should be fed on roots, grass, and up to 1lb. of meat meal or other high protein feed daily. Grazing pigs should not be confined to small paddocks during winter. The use of large grazing areas will reduce pasture damage considerably. Warm accommodation is essential for winter store pigs to avoid losses and maintain steady growth.

PIG PRODUCTION

Early farrowing sows should be put in their farrowing quarters and fed 3lb. to 4lb. of meal daily. After farrowing they should be fed 4 gallons of milk plus ½ gallon for each piglet suckled. Where insufficient milk is available meal should be used to replace the milk in the ratio of 1lb. of meal to 1 gallon of milk. Constipation, which is common in late pregnancy, can be avoided by feeding ½lb. of bran daily or 4oz. of molasses two or three times during the last 10 days before farrowing.

Heading photograph by Sparrow.

Pasture Management

Seasonal Notes by the Extension Division

NORMAL dairy farm practice is to close paddocks in succession from mid-April to mid-June to provide feed for late winter and early spring. While this is being done the herd, which is drying off, is rotated on a restricted pasture area and the feed supplemented with hay or silage. This practice is most successful on well-drained soils, but often requires modification on poorly drained soils.

WET MEADOW LANDS

ON heavy meadow soils, particularly in wet winters, rationed grazing may not be practicable at certain periods, and on the wetter farms even the normal paddock-by-paddock rotational grazing may have to be abandoned temporarily and replaced by a policy of spreading the herd over a larger area of the farm by placing a few cows in each paddock. A concentration of stock at the rate of 15 cows per acre or more, as dictated by a normal subdivisional plan, can lead to the almost complete destruction of the pasture in each paddock as it is grazed in its turn.

Cows which have calved may be operated for a period as one herd, but as their numbers increase it may be wiser to divide the calved cows into two or more groups and rotate each group over three or four paddocks. As soon as conditions permit, rotational grazing should be reverted to and saved pasture should be rationed with the electric fence.

A winter run-off can be of tremendous assistance to the satisfactory management of soils which poach, but it is not the complete answer, since the calved cows must be returned to the farm while the land is still wet, so that the grazing management which has been outlined must still be adhered to. Because it is not always possible to ration saved pasture and because conditions may not be suitable for feeding out silage, much greater reliance has to be placed on hay, and to reduce poaching and minimise waste this should be fed from racks set up on a concrete strip.

—G. L. BANFIELD

* * *

DRAINAGE PROGRAMME

FARMERS should take stock of their drainage problems during winter. At this time it is generally too wet to undertake any active drainage operations, apart from the cleaning of open drains not completed in autumn and the constant inspection of tile and mole outlets to ensure free discharge. Paddocks which will benefit from drainage should be selected for attention. These may not necessarily be the wettest areas on the farm, but could be paddocks which are called on to carry heavy concentrations of stock during the wet months or alternatively are required to produce supplementary feed crops. The drainage of these areas could result not only in a higher production of feed, but in better utilisation of the feed grown and an absence of pugging of pasture and consequent longer life.

Drainage operations are best done when the paddock is in grass. This could be old grass before ploughing, in which case benefits are received by any intervening crops and by the new grass when the paddock is resown. If surface levelling is necessary, this should be carried out while the paddock is being worked and drainage operations delayed until the new grass has established.

Any drainage scheme should be planned months in advance. If outside advice is to be sought, time is required while plans for a scheme are prepared. There will be further delay, perhaps 6 months in some parts of the country, before tiles can be delivered, and if contractors are to be employed, they will generally require notice well in advance.

Now is the time to decide on the area to be drained and to prepare a scheme to satisfy the requirements of the farm.

—J. F. SCOTT

* * *

ELECTRIC FENCES FOR BREAK GRAZING

THE electric fence is now firmly established as an essential aid to efficient pasture management and supplementary feeding on dairy farms. On sheep farms its use has been more restricted, but in recent years progressive sheep farmers have evolved electric fencing systems which have proved successful for the control of sheep grazing.

The electric fence has been found useful for break feeding of lambs and for holding ewes on restricted grazing before flushing, but it is most useful during winter and early spring, when there is little pasture growth in most districts.

Increased reliance on saved pastures has led to more widespread use of electric fencing on sheep farms. The efficient utilisation of this valuable saved grass, often produced by costly topdressing, depends on feeding in small breaks, and the frequency with which break fences must be shifted has made the electric fence a virtual necessity. Electric fencing has been found equally effective for break feeding of supplementary feed crops, and owing to its cheapness and ease of erection it has replaced the netting fence on many farms.

Though one wire is sufficient for dairy stock, a minimum of three is required for sheep. The bottom wire should be low enough to prevent sheep grazing under it, usually about 9in. high. (In tall pasture it should be placed higher initially and lowered later.) The second wire should be 9in. above the first and the top wire 9in. to 18in. above the second. Top and bottom wires should be electrified and the middle one earthed. Shifting of the 3-wire fence is facilitated by provision of a portable stand with three reels and light metal standards fitted with insulators of adjustable height. Full details of such a system appeared in the May 1956 issue of the "Journal" (page 432).

—S. M. J. STOCKDILL

* * *

HILL COUNTRY TOPDRESSING

PHOSPHATIC fertiliser, mainly superphosphate and serpentine superphosphate, have been the mainstay of hill country topdressing, and rightly so, because practically all such country is deficient in available phosphorus. Recent experimental work, however, has shown that a deficiency of some other minerals, notably molybdenum, potash, and lime, can severely limit the response of clovers to applications of phosphates on certain soils and that no amount of additional phosphate will improve results until the particular deficiency is corrected by the application of the mineral required.

In the case of molybdenum, which is deficient on many soils derived from sandstone and greywacke, 2oz. to 2½oz. of sodium molybdate per acre, applied with the phosphate topdressing, can bring about a remarkable change in the vigour of clovers, which will last for several years.

Where lime gives a good response over and above that obtained from phosphates, which happens on many clayey soils, carbonate of lime should definitely be applied. However, because of high transport and spreading costs the usual rates recommended for lowland farms would seldom be payable on the relatively low-producing hill country. On some hill soils experimental work has shown that dressings of lime as low as 3cwt. to 5cwt. per acre will give good responses lasting 4 years. Farmers should discuss the use of molybdenum, potash, or lime in topdressing hill country with their local Instructors in Agriculture before deciding on their topdressing programme.

—J. A. GRAHAM

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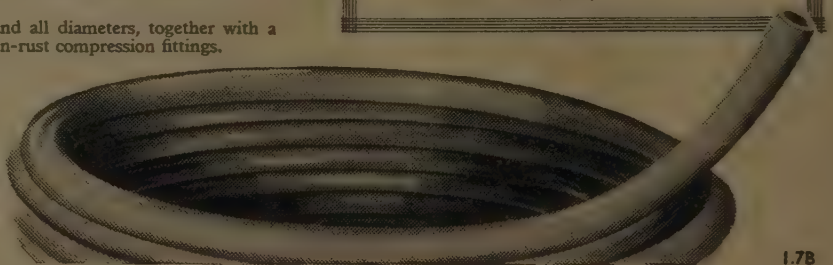

1.7B

Seed Production in New Zealand

Cocksfoot

By G. K. McPHERSON,
Irrigation Research Officer, Department of Agriculture, Ashburton

▲ Reaping a cocksfoot seed crop. On the plains land, where mechanisation is possible, cocksfoot is usually cut high with the binder and later threshed from the stook.

IN the earlier part of this century, when the bush in the North Island was being felled and burnt and the ground surface sown, cocksfoot was probably the most important grass in New Zealand. In those days it was often referred to as the "king of grasses". That role has been taken over by perennial ryegrass, which now tends to take a major place in most permanent pasture mixtures sown on ploughable country, but as a constituent of grasslands pastures cocksfoot is still important.

COCKSFOOT (*Dactylis glomerata*) is a constituent of most of New Zealand's dairying pastures and also has a place on much of the land devoted to cattle and sheep raising. It is a perennial grass with a fairly wide range of habitat. It will thrive and produce good feed on land appreciably lower in fertility than that demanded by perennial ryegrass, though possibly it shows to best advantage in what might be termed medium-class country, where it is not subjected to the keen competition of perennial ryegrass, such as occurs on the more fertile land. Cocksfoot is a shade-loving grass, and in a very leniently grazed sward it soon tends to become dominant. On the other hand, if cocksfoot is subjected to close and continuous grazing, particularly by sheep, it is inclined to lose its vitality and is readily replaced by other grasses.

History of Production

As a seed producer cocksfoot has been prominent in New Zealand agriculture for many years, and the history of its production in the initial stages is linked with Banks Peninsula, where probably the first seed produced in New Zealand was harvested almost a century ago. Below are a few extracts from H. C. Jacobson's book "Tales of Banks Peninsula":—

"Farm life on the peninsula is intimately connected with cocksfoot or orchard grass. There is no doubt that the peninsula soil is especially suited to the production of good cocksfoot seed."

Referring to a particular area, the story continues: "In the autumn of 1852 the land was ploughed and sown in wheat, and after it was harrowed two ridges were sown in cocksfoot.

The crosses indicate the principal cocksfoot seed-producing areas. Production in the North Island is negligible, the little cocksfoot that is harvested coming mainly from the Wellington and Hawke's Bay Provinces.

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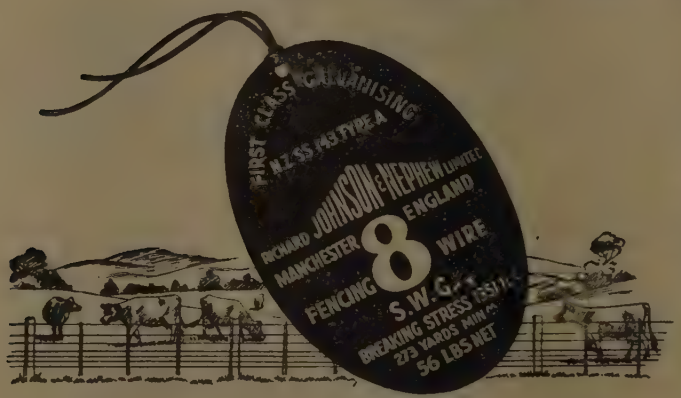

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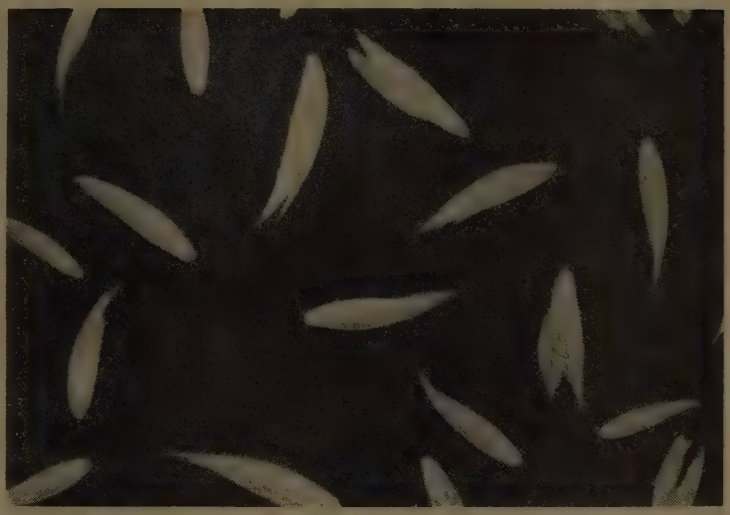
Then it got one stroke of the harrows to cover it. The seed was obtained from Mr. William Wilson, seed merchant, of Christchurch, who imported it from England. Mr. Wilson said it was the very grass for the rough hills of the peninsula, which has been well proved. The wheat was reaped on the land in January, 1853. In a few weeks all the stubble was hidden with the cocksfoot. In December, 1854, and January, 1855, these patches of cocksfoot were reaped with the hook, and it was like a crop of wheat. It was all tied in sheaves and stacked in small stacks in the old Scotch fashion.

"At this stage, that is 1855, most of the settlers in Pigeon Bay commenced to get a few heads, and many of them sowed it in their gardens, and that is how it spread. In 1854 my father imported a two horse-power threshing mill from Scotland. It threshed the wheat, oats, barley, and ryegrass splendidly, but when the cocksfoot was tried it did not take out more than half the seed. Most of it was put through twice, but the result was not a success, and we were compelled to go back to the flail. In 1865 and 1866 large orders were coming in for the seed. Up till that time it was all tied in sheaves and stacked in the same way as grain, but in 1867 an area which was very ripe was cut short and laid on the stubble. It threshed out so well that the next season this method became universal . . .

"In 1874 we grew the largest crop we ever cut. We cut over 7000 bushels, allowing 20lb. to the bushel. We commenced to sell at 6d. a pound and we quitted the last at 10d. a pound. I think it averaged about 8d. a pound. Whenever it came below 4d. we gave it up. We found that when it came below 4d. we made more from cattle and sheep. We cut one paddoock for 13 years in succession. It got burned and we spelled it for a year, and cut it for six years more, making 19 years in all. We never noticed any difference in the last year's crops. They seemed as good as the first."



Cocksfoot seed.

So started an industry on the peninsula which reached its zenith about the turn of the century. About that time seed production reached 100,000 sacks or more annually, with about five sacks of cleaned farmers' dressed seed to the acre. From about 1900 the acreage devoted to the production of cocksfoot seed began to decline. This decline was somewhat gradual until 1913-14, when the acreage reserved for seed production fell away very rapidly. The rise in the cost of labour for cutting cocksfoot by hand, the rise in the price of sheep and cow products, the falling off in the demand for seed for sowing bush burns in the North Island, the subdivision of large farms on the peninsula, and the importation of Danish cocksfoot seed were possibly all factors contributing toward the decline. In recent years the area harvested for seed annually on the peninsula has barely reached 200 acres.

Young cocksfoot pasture.

Trend to Ashburton and Southland

Concurrently with the decline in acreage on the peninsula the area used for cocksfoot seed production in Ashburton County gradually increased. By 1916 this county was contributing 11 per cent. of the Dominion acreage cut for cocksfoot seed. This percentage steadily increased each year until in 1931 of a Dominion total of 14,000 acres cut for seed Ashburton County harvested 5000 acres, or 36 per cent. Most of this seed was grown in the Eiffelton district, which proved eminently suitable for the production of cocksfoot seed. Further, as the land was flat, the crop could be harvested mechanically.

The method of harvesting was to cut the cocksfoot with the binder, stook it, and then mill thresh it. The cost of harvesting by this method was considerably less than that of the method on the hilly land of the

BIRTHPLACE OF THE COCKSFOOT SEED INDUSTRY

For many years the hills of Banks Peninsula, particularly near Akaroa, were associated with the production of cocksfoot seed. The soil and the type of farming both suited cocksfoot and its seed production. In more recent years with the advent of mechanisation the production of seed has shifted to the plains of Canterbury and Southland. Above—Country typical of that on which Akaroa cocksfoot has been harvested for many years. Left—Most of the Akaroa cocksfoot is cut with sickles and later threshed with small portable mills. Below—Even now bullocks are used to transport the small threshing mills to places inaccessible to horses.

[Upper photo by "New Zealand Farmer" and lower two by "Star-Sun"

peninsula, where the bulk of the cocksfoot had to be cut with a sickle. Until 1948 Ashburton County continued to harvest some 3000 to 4000 acres yearly. In recent years this figure has dropped to about 2000 acres.

The third district associated with extensive cocksfoot seed production was Southland County. There the industry is of comparatively recent origin, but the expansion in acreage has been much more rapid than in Ashburton County. In 1935-36 the area harvested for cocksfoot seed was 311 acres; 7 years later it had increased to 2173 acres, and in the 1945-46 season the acreage was 5692, which was the peak. Latterly it has been between 2000 and 3000.

The recent trends in Ashburton and Southland Counties reflect the general trend in acreages for seed production. Where as for a period up to 1947 over 10,000 acres were harvested each year with a peak in 1941 of over 18,000 acres, since then the area has not exceeded 9000 acres and has been lower than 5000 acres.

Soil Types

Some areas of land in New Zealand have often been referred to as natural cocksfoot country—for example, Banks Peninsula, Otago Peninsula, and parts of Ashburton County. On such land cocksfoot is easily established and a stand readily maintained under suitable management. However, experience suggests that cocksfoot can be grown quite successfully on a wide range of soil types, but the most satisfactory yields of seed are usually obtained from river silts, free-working loams, or peaty soils containing an admixture of clay. Stiff, clayey soils which are inclined to crack during dry weather or soils with an ironstone pan do not suit cocksfoot. In other words, the crop demands good drainage and facilities for deep rooting. Good wheat land with open-textured soil will usually produce good yields of cocksfoot seed.

It is doubtful if an attempt should be made to establish cocksfoot for seed on the lighter or drier soil types, as seasonal conditions cause too great a fluctuation in yields. In Southland cocksfoot does well on the alluvial river flats and the silt loam soil type of the easy, undulating country.

Place in Rotation

Cocksfoot for seed has no definite place in the rotation of crops, particularly where the land is in good heart. If the land has been reduced in fertility as a result of growing several white crops before it is sown down to cocksfoot, it may be advisable to improve the physical condition and fertility of the soil with greenfeed crops assisted by suitable fallowing.

Twitches, docks, and Yorkshire fog are very undesirable in a cocksfoot stand, and preparation of the ground should therefore aim at reducing these to a minimum before sowing. Because of the difficulty of separating ryegrass seed from cocksfoot seed during machine dressing it is also essential to sow cocksfoot for seed production only on land known to contain no ryegrass or at most only a very slight trace.

Establishment

Usually little difficulty is experienced in obtaining a successful stand of cocksfoot on land naturally suited to it. In some instances 3lb. to 4lb. of cocksfoot seed included in an ordinary pasture mixture, with proper management, have resulted in cocksfoot-dominant stands producing very satisfactory seed yields. Where the soil conditions are not as favourable more care is necessary for a first-class stand to be obtained.

There are several ways of establishing a stand for seed production. Particularly in recent years many stands have been established by sowing cocksfoot seed alone on a fallowed surface. This method has the advantage that a strike is practically assured and furthermore if the seed is sown during December or January, there is every prospect of a reasonable crop about 12 months after sowing. When the seed is sown in this manner it is usual to drill it through every coulter on a fine and firm seed-bed. Shallow drilling is essential, so coulters with well-worn points should be used. One hundredweight an acre of reverted superphosphate or serpentine superphosphate should be drilled with the seed; in wetter districts straight superphosphate can be used.

Another method frequently used is to sow cocksfoot in spring in a cover crop such as wheat, barley, oats, or linseed. The crop is usually drilled in and the cocksfoot seed broadcast at the same time; if cocksfoot is sown with rape, they may both be drilled, the cocksfoot seed being mixed with the fertiliser and sown through the manure box. In districts where annual weed growth is prevalent this method possibly has an advantage over the sowing of pure cocksfoot in that the cover crop tends to check weed growth to some extent in the initial stages. For stands in a cover crop cocksfoot seed only may be sown or 2lb. to 3lb. an acre of cowgrass seed may be included. If the cocksfoot seed is sown on its own, it is usual to reap a cocksfoot crop about 12 months after the cover crop is harvested. If cowgrass seed is included, the common practice is to take a hay crop, and possibly a seed crop of cowgrass, 12 months after the cover crop is harvested, and a crop of cocksfoot seed the following year.

Overseas experience has indicated that the seed may be drilled in 21in. or 28in. rows to permit intercultivation of the crop, at least in the early years of the life of the stand. To do this the seed is sown through every third or fourth coulter of the grain drill. This method has not been tried extensively in New Zealand, but it has shown sufficient promise to warrant further areas being thus sown. In Otago and Southland successful stands have been established by sowing the seed through the back manure box of a turnip ridger.

Cocksfoot sown in rows to permit intercultivation.

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It has been suggested that 1lb. to 2lb. of white clover seed should be included with the cocksfoot to supply nitrogen to the young, developing cocksfoot plants and thus promote a more vigorous stand, but there is some doubt about the efficiency of this procedure under all field conditions. On some classes of soil in Canterbury where the practice is adopted white clover tends to dominate the sward during the first year, and a hay crop, or possibly a crop of white clover seed, may be taken at the first harvest. On other soil types the reverse may happen; that is, the young cocksfoot may grow so vigorously that the white clover is almost completely smothered.

Sowing Rates

Opinions vary on the best quantity of cocksfoot seed to sow to establish a suitable stand for seed production. It is generally accepted that the best-yielding stands, and also those which produce the best-quality seed, are those in which the plants are fairly wide apart. Given sufficient room, individual plants develop a robust growth with bold heads, whereas in a thickly sown stand the plants do not seem to have the same vitality. The difficulty, of course, is to estimate the necessary seeding rate to give the optimum thickness. This will vary with the soil type, the condition of the paddock, and whether the seed is to be drilled or broadcast; the amount of annual weed growth likely to compete with the young cocksfoot is also a factor.

In Ashburton County good cocksfoot stands have been obtained with seedings as low as 5lb. an acre, but the majority of farmers sow 8lb. to 12lb. an acre, the larger quantity if the seed is sown broadcast. In Southland the standard quantity is about 6lb. an acre drilled or about 12lb. broadcast; drilling is more usual.

Management

Very little reliable information is yet available about the management of cocksfoot stands for seed production. The results of topdressing with sulphate of ammonia are being investigated at present, but the effect of stocking or burning on seed yields and quality is still largely a subject of conjecture.

It has been the practice to harvest many, perhaps most, seed-producing stands for seed and do nothing further with them until the binder is brought in the following year to begin harvesting again. Some stands treated in this way have continued to produce profitable yields of seed for 10 to 20 years or more. Over the years such a stand gradually builds up a mass of decaying leafage, which prevents the crown of the cocksfoot, a shade-loving plant, from becoming unduly exposed to direct sunlight. If the dead material is not disturbed, a cocksfoot stand will remain relatively pure for quite a few years.

Windrowing the crop and later picking up with the header harvester has not been very successful.

But though this mass of decaying leafage assists in maintaining a reasonably pure stand, might it not also have a detrimental effect on the yield and quality of the seed? In many respects this question remains unsolved. It is well known that if a cocksfoot stand is subjected to indiscriminate grazing, particularly by sheep, the plants gradually die out and are replaced by foreign growth. The decline of cocksfoot seed production on Banks Peninsula can be attributed largely to uncontrolled grazing of the seed areas. Though severe grazing of an area is recognised as detrimental to seed production, light and controlled grazing with cattle may have a beneficial effect in both yield and quality of the seed. Many producers of cocksfoot seed believe that some grazing of stands in autumn is desirable. The stock trample some of the decaying material into the ground, allowing some sunlight into ground level, and a much more vigorous type of plant results.

The burning of stands to remove a portion of the decaying material has had indifferent results. Sometimes good yields of seed have followed burning, but in other cases the reverse has happened. However, until more is known about the best time of the year and the best condition of the sward for burning it cannot be recommended for renewing a stand from which the seed yield has ceased to be profitable.

Since cocksfoot stands are grazed lightly if at all, the return from stock to the soil in the form of dung and urine is negligible. Decay of dead leaf and straw is slow and after the second year there is a tendency for stands to become progressively more starved for nitrogen. In an attempt to remedy this condition, the addition of nitrogen, usually as sulphate of ammonia, is becoming quite common.

The usual dressing is from 1cwt. to 1½cwt. per acre applied in spring, but experimental work in Mid-Canterbury indicates that 1cwt. applied in autumn, followed by 2cwt. in spring, may give still more profitable results. This was the dressing used in four trials in Mid-Canterbury over the last 2 years. The trials were simple, part of a paddock (about 5 acres) being topdressed and the seed harvested off the area being compared with that off the balance of the paddock.

In 1950-51 three topdressed areas showed increased yields (75 per cent., 66 per cent., and 12 per cent.) of machine-dressed seed over the corresponding areas not topdressed. In the remaining trial nitrogen appeared to depress the yield of machine-dressed seed by 25 per cent. In this case, however, the grower explained that the topdressed area gave a much

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better crop, but this was lost by wind before harvest. In the 1951-52 season three trials gave increased yields of machine-dressed seed of 32 per cent., 54 per cent., and 32 per cent. with topdressing. No machine-dressed weights were available from a fourth trial in a very light-yielding paddock, but from the topdressed part 3½ sacks per acre were obtained off the header as against one sack per acre from the non-topdressed area. In a fifth trial topdressing appeared to depress the yield of machine-dressed seed by 14 per cent.

Though sulphate of ammonia has been used in these trials, quite possibly a fertiliser of the ammonium nitrate plus calcium carbonate type would have been equally beneficial. In fact, on ryegrass seed crops it has proved slightly superior to sulphate of ammonia.

The above figures give some idea of the increased yields which can be expected from nitrogen. Whether they will be profitable or not depends on three factors—the price obtained for seed, the cost of topdressing, and the productivity of the stand.

If the increase in yield necessary to cover the cost of the fertiliser is calculated, it can be judged whether this increase is likely to be obtained and therefore whether topdressing is justified economically. Work done to date indicates that topdressing is not harmful to stands, and that stands are improving under the annual dressing of 2cwt. of sulphate of ammonia per acre.

Harvesting

Examination of the kernel probably gives as good an indication as any of when cocksfoot is ready for harvesting. When the majority of the kernels are fully formed, with some of the seed mature, crops may be cut. At this stage seed may be knocked out of some of the riper heads if the heads are hit lightly on the hand. The farmer must choose between harvesting good, bright, heavy seed, with the risk of loss of seed by shaking, and the earlier harvesting of light, immature seed, which unless heavily machine dressed, will have a low bushel weight because of the high percentage of seeds containing no kernels or only partially developed kernels.

Locality largely determines the method by which the seed is harvested. On the hilly country of Banks Peninsula the only practicable way is to reap the cocksfoot with sickles and leave it in bundles on the stubble until it is mature. It is then carted in by hand and threshed on small portable threshing machines in the most convenient positions. Because of the large amount of hand labour involved harvesting cocksfoot by this means is profitable only when either the yield or the price of the seed is high. Where the contour of the country permits, which applies to practically all cocksfoot areas outside Banks Peninsula, the common practice is to cut the crop with a binder, stook it, and then either thresh from the stook or stack and thresh from the stack. On the flatter land of Canterbury it is usual to thresh cocksfoot from the stook, but in wet seasons it may be necessary to stack the crop before threshing it. In Southland threshing from the stook is common.

To avoid too much leafage in the sheaf the binder is usually set fairly high when cutting the crop. Some farmers place a sack apron under the working parts of the binder to collect any seed threshed out during cutting. In moderately good weather cocksfoot is usually left in the stook for about a fortnight before being threshed. With a tractor-drawn 8ft. binder about 3 acres an hour, or 25 to 30 acres a day, can be cut. For threshing the crop either a tin mill or a wooden mill is used, the former now being the more common. A tin mill operated by seven men usually threshes about 16 bags an hour in an average crop.

Normally cocksfoot is fairly difficult to thresh, and care must be exercised that good seed is not blown out with the cavings. Conversely, if too high a proportion of cavings is left in the seed, the sample will be poor and the machine dressing loss high.

In recent years a few farmers have windrowed their crops and then threshed them by picking up from the windrow with a header harvester, but results from this method have been indifferent. In good weather it can be quite satisfactory, but if a period of unsettled weather with intermittent rain occurs after windrowing, the loss of seed may be considerable.

Quantity and Quality of Yield

Yields of seed vary widely from season to season. The weather is perhaps the main factor influencing the yield in any year. Lack of sufficient rain at critical periods, dull, showery weather during the time the cocksfoot is in flower, or frosts when it is at or near the flowering stage may all adversely affect yields.

In a normal season a yield near 150lb. of machine-dressed seed an acre can be expected, though the yield may vary widely. Individual paddocks in favourable seasons have yielded as high as 600lb. of machine-dressed seed an acre, but yields of less than 20lb. have frequently been obtained when conditions for growth have been unfavourable.

The quality of seed also varies from season to season. Usually, poor yields are associated with low-quality seed. Apart from the presence of foreign matter, low quality in cocksfoot seed usually means that a high percentage of the seed has no kernel or only a partially developed kernel. Such seed has a low bushel weight. On the other hand, seed of which the majority has a fully formed kernel usually has a high bushel weight and is referred to as good-quality seed.

Stooking cocksfoot in the Ashburton district.

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The machine-dressing loss is related to the quality of the field-dressed seed. The object in dressing is not only to remove any foreign seeds but to reduce to a minimum the amount of inert matter such as stalks and seeds without kernels. Good, bright, heavy seed off the mill or header will have a low machine-dressing loss, possibly 25 per cent. or less, whereas the loss in dressing light seed may reach 50 per cent. or more.

Strains of Seed

Strains of cocksfoot fall generally into one of two distinct groups. These are the leafy types such as the New Zealand and Aberystwyth strains and the stemmier Danish strains.

New Zealand cocksfoot first became renowned for the strain on Banks Peninsula, known locally and overseas as the "Akaroa" strain. An investigation during the 1930s showed that virtually all the seed being harvested in New Zealand was of this strain, despite importations of Danish seed from time to time. Akaroa cocksfoot as a strain is somewhat variable, and from it Lincoln College selected the C23 strain. More recently a further improvement in type has been made in a selection of the Grasslands Division of the Department of Scientific and Industrial Research. Seed saved in New Zealand today is of one or other of these strains.

For a few years now cocksfoot seed production has not met New Zealand's needs for pasture establishment and importations have been necessary. In importing, preference is given to Certified seed of the Aberystwyth strains, which is permitted entry into this country without being stained. At times, however, supplies of this seed have not been sufficient to make up local deficiencies, and importation of seed of unauthenticated origin, including seed of Danish strain, has had to be imported. Such seed has a proportion of the bulk stained red for identification.

Whatever the merits of individual strains elsewhere, the leafy strains, and particularly those of local origin, are to be preferred for pasture establishment in New Zealand.

Certification

Certification of cocksfoot seed was first carried out by the Department of Agriculture in the 1931-32 season, when all cocksfoot seed areas on Banks Peninsula became eligible for certification, together with areas elsewhere in New Zealand from which a sample of seed had already been tested and had been shown to be of the same strain as that from the Banks Peninsula areas.

The Banks Peninsula growers formed themselves into the Akaroa Cocksfoot Seed Growers' Association to co-operate with the Department in the certification of their produce. Two classes of seed were recognised in the certification scheme, "Mother" seed and "Permanent Pasture" seed.

In 1937 the scheme was amended to identify separately the C23 strain, which then became available and two additional higher classes of Certified seed, "Government Stock" and "Pedigree", were introduced. Though subject to the usual certification procedure, areas producing Government Stock seed are under the control of the Department of Agriculture, which is also responsible for the distribution of seed certified in this class.

In 1953 the strain evolved by the Grasslands Division had been multiplied to a stage where it was possible to release it as Certified Government Stock seed, replacing the C23 strain. After 1958 all seed certified in the Pedigree class will be of the strain released from the Grasslands Division, and this will also progressively replace both the Akaroa and the C23 strains in the other certification classes.

The basis of certification in all classes is the strain of the cocksfoot. Because of the harmful effects of ryegrass contamination in cocksfoot seed areas, however, the following standards of freedom from ryegrass seed are set for the different classes:—

Certified Government Stock seed—not more than a trace.

Certified Pedigree seed—not more than 0.5 per cent.

Certified Mother seed and Certified Permanent Pasture seed—not more than 3 per cent.

Insect Pests

Cocksfoot stands are ideal for harbouring insects and many different types are found associated with the plants. Only two are considered to be pests, the cocksfoot stem borer and the cocksfoot midge.

Stem Borer

The stem borer, *Glyphipteryx achlyoessa*, is usually found about harvest time as a whitish caterpillar in the hollow centre of the cocksfoot seed stalk. The adult stage of this insect is a small, inconspicuous, greyish moth which is on the wing during October and early November. This moth lays its pale-yellow eggs singly on the blades of the cocksfoot and in about 3 weeks the young caterpillars hatch out.

Immediately after emerging each minute caterpillar crawls down between the sheaths and enters the tender stem of the developing seed head, which at that time is concealed within the closely wrapped leaf blades. In 2 or 3 days the young caterpillar eats completely around the stem, its path being marked by a tunnel, which is later noticeable as a brown mark around the stem above a node. The result of this injury may be an early whitening of the seed head, resulting in complete loss or the retarding of growth at any stage between the time the head leaves the shot blade and the harvesting of the crop. However, the majority of heads appear to ripen normally at harvest time.

After making the ring the caterpillar enters the centre of the stem, which is becoming hollow, and moves up this central cavity toward the head. Later, when the head ripens and loses its moisture, the caterpillar, by then more than ¾in. long, moves rapidly down the straw toward the root and bores along the length of the solid, succulent, underground stem. The majority of caterpillars are feeding in the underground stem during February and are fully grown by the end of March. In May and through the winter there is a steady migration of caterpillars ascending the straws before changing into chrysalises. Not until September and early October is the change to the chrysalis stage completed, and the insects remain in this stage for several weeks before a new season's moths begin to emerge. The moth thus takes 12 months to complete its life cycle.

The occurrence of the stem borer caterpillar in cocksfoot crops varies considerably with the situation and age of the paddocks. Recently planted areas, except those near heavily infested stands, show only a very low percentage of straws containing the caterpillar. When a few younger stands were sampled for three seasons the infestation was found to increase at the rate of about 10 per cent. a year. The insect appears to build up until 35 to 65 per cent. of the straws are infested, and only under conditions very favourable to the insect will the infestation reach 80 to 90 per cent. in any paddock. The loss of seed through white heads occurring in a crop has not been estimated.

Cocksfoot Midge

The cocksfoot midge, *Stenodiplosis geniculata* Reuter var. *dactylidis*, is a tiny dark fly with a red body which lays its pink eggs in the opening flower of the cocksfoot seed head. The maggots which emerge from these eggs feed on the developing seeds and the later broods live inside the seeds. This fly takes only a few weeks to complete its cycle.

It was found that 65 to 75 per cent. of the seed from roadside cocksfoot was infested with the midge, whereas machine-dressed seed harvested from paddocks contained about 1 per cent. of damaged seed. This difference is probably the result of the habits of the midge, which overwinters in the uncut seed heads.

Because on the plains uncut cocksfoot is mainly confined to roadsides and fencelines, the midge has to reinfest a cocksfoot paddock each season, whereas the stem borer overwinters within the stand.

Cocksfoot Thrips

Another insect known to damage cocksfoot seed is the cocksfoot thrips, *Chirothrips* sp. It is a small black insect with the appearance of a typical thrips.

The extent of the injury to cocksfoot seed heads caused by this insect is not fully established, and its life history is not fully known.

Other Insects

Among other insects associated with cocksfoot seed production is a cicada, one of the "insect singers" which abound in the fields at harvest time. The female cicada punctures the cocksfoot straw, making a line of jagged holes within which it lays its eggs. The wingless, clawed nymphs which hatch from these eggs live in the ground, feeding at the roots of the cocksfoot.

When cocksfoot is flowering a green plant bug about ¼in. long sucks the sap from the seed heads. A few weeks later a bug of darker colour is numerous on the ripening heads.

Other injurious insects are the grass-grub (*Costelytra zealandica*), subterranean caterpillar (*Porina*), and army worms usually found in grass paddocks, and a weevil found at the base of the stem. Damage may also be caused by mealy bugs and thrips on the seed stalk and by the maggots of a tipulid fly, which are sometimes numerous in the wet surface soil under the cocksfoot flag.

Disease

A bacterial disease of cocksfoot which has come to the notice of the Department of Agriculture is bacteriosis, or Rathay's disease, an account of which appeared in the November 1956 issue of the "Journal".

The disease causes destruction and distortion of the developing spikelets, with consequent loss of seed yield.

Overseas Trade

Up to 1949 a considerable quantity of cocksfoot seed was exported, principally to Great Britain, which until then had always been the principal market for surplus seed, but Australia had taken small quantities at various times.

The inability of Great Britain to obtain supplies of cocksfoot from the Continent during the war greatly increased the demand for New Zealand-grown seed and resulted in consequent expansion of the local industry. At the same time cocksfoot seed growing in England received an impetus which was to have a serious effect on seed production in New Zealand. English growers have been able to harvest much heavier yields of seed of higher purity and germination. By 1947 the English market for New Zealand seed had disappeared and English merchants became sellers of high-quality seed at lower prices. The local industry received a setback from which it has not recovered, and despite a potential market in Australia for New Zealand seed, New Zealand has become a regular importer.

Improvement Necessary

Cocksfoot seed has been produced in New Zealand for almost a century, during which time the industry has had its ups and downs but has survived. At times the price to the grower has returned him a very handsome profit, but on other occasions he has found it exceedingly difficult to dispose of his seed at a price which would even cover the cost of production.

A season of low yields and low prices usually forces many farmers to seek alternative crops as a source of revenue. Usually under such circumstances the poorer-yielding cocksfoot stands are ploughed up and the area sown down in some other crop such as wheat, oats, barley, peas, or swedes. With a return to better prices for the seed more cocksfoot stands are again sown down.

If New Zealand is to compete successfully with other countries in the production of cocksfoot seed, improvement of both the yield and the quality of the seed seems necessary. There is ample scope for improvement in both.

"An Introduction to the Botany of Tropical Crops": Leslie S. Cobley

IN recent decades the attention of the world has been more and more focused on the tropics as a potential source of food and raw materials to cover the ever-increasing demands of a steadily growing world population. This attention is well justified by the astonishing number and diversity of plants of economic and food value which can be grown between the Tropics of Cancer and Capricorn, particularly as present improved communications facilitate the distribution of these products throughout the world.

Seen in this light, Mr. Cobley's book is welcome as a valuable contribution to the knowledge of tropical crops. Though the main object was to give a survey of the botanical features of the most important plants, the author has given the book an added interest by briefly outlining the uses and applications of the various products, for some of which the method of processing to obtain a marketable product is also mentioned.

The information in this book is based on 14 years' experience in various parts of the wet and dry tropics, of which 9 were spent by the author lecturing in tropical crop botany at the Faculty of Agriculture of the University of Khartoum. Several outstanding scientists (Dr. E. E. Cheesman, Dr. E. N. Howes, Professor G. E. Blackman, and others) have assisted in the preparation of this book.

Though the volume is mainly designed as a text-book, the author has had the commendable idea of not following the usual botanical classification. The various crops have been classified under more practical headings: Cereals, fibres, oil seeds, pulses, root crops, spices, beverages, and drugs, fruits, vegetables, rubber, and essential oils, thus making it easy for the non-botanist to find his way through the book.

The author does not claim to have written a comprehensive botanical account of all the tropical crops with all the newly developed lines and hybrids, which would require several volumes, but one would have expected even in this restricted work a necessarily brief treatment of pasture and fodder crops as being of fundamental importance for the animal industry in the tropics.

Comprising more than 350 pages, including a botanical and a general index, this work is a valuable aid for all who are interested in tropical crops and their products.

—J.C.G.

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Preparing Section Comb Honey for Market

By E. SMAELLIE,
Apiary Instructor, Department of Agriculture, Auckland

COMB honey is a product of nature which cannot be duplicated by other manufacturing processes, nor can the quality or flavour of the honey as gathered and stored by the bees be improved by beekeepers. On the other hand these natural qualities can be impaired or destroyed after the honey has been harvested unless proper attention is given to their maintenance. As the popularity of comb honey depends on its delicate flavour and attractive appearance beekeepers should ensure strict storage conditions while the honey is being prepared for market and ensure that it is correctly packaged to withstand handling in shipment and reach its destination in first-class condition. In this article, the last of the series on section comb honey, the author outlines methods and precautions which beekeepers must observe when preparing this honey for market. In next month's issue he will describe the production of cut-comb honey.

TO prevent the appearance of comb honey from being spoilt in the hive with travel stain it is essential for beekeepers to remove the honey from the hives as soon as the bees have fully capped the combs. With this procedure the major portion of the season's yield is harvested and in the honey house before the main honey flow has ceased. Once comb honey has been harvested it should be placed on the market as soon as possible. However, when comb honey is produced in commercial quantities some months may elapse before the last of the crop can be prepared for shipment and a long storage period will be unavoidable.

Good Storage Essential

With these circumstances great care must be taken to maintain good storage conditions, especially when the honey has to be stored during wet or cold weather or where humid conditions are usual. Honey is hygroscopic and if water condenses on the surfaces of the combs, the honey is diluted and then sours. Under cold temperatures the beeswax comb contracts, and this fractures the cells and cappings, causing the honey to weep from them; also fluctuation of storage temperatures within the range of 50 and 60 degrees F. induces the honey to granulate. To avoid deterioration in the honey from such causes it should be stored in a warm, dry room with a free circulation of air. The room temperature should be maintained at as even a temperature as possible between 70 and 90 degrees F., though it should never drop below 70 degrees if possible.

The full supers should be stored in close-fitting tiers with each tier covered with a board similar to a division board or inner lid. As the correct storage temperatures are also favourable to the incubation of wax moth eggs, the tiers should be arranged at floor level above wooden battens so that each tier can be fumigated immediately the supers are brought in from the apiary, and again every 5 or 6 days to prevent damage by the larvae of wax moths. In northern areas experience has shown that fumigation should be continued in this manner until such time as the combs are finally packed and shipped.

Section combs require careful preparation and grading before being packed for market. It should always be remembered that the greatest care is necessary when comb honey is being handled, as once a section is damaged it cannot be repaired. To facilitate the work ample bench and working space is essential.

Cleaning of Sections

So that the sections will have a clean and marketable appearance the wood of each section must be thoroughly cleaned of all propolis and stains. For this many beekeepers use an ordinary household knife as a scraper. However, when large numbers of sections have to be cleaned a first-class job can be done more quickly with a sanding disc mounted on the spindle of a saw bench. With the nozzle of a suction cleaner mounted near the sanding disc the fine dust from the sander is sucked up and

Left—Wrapping sections. Right—Heat-sealing the end folds of the wrapping. A thermostatically controlled household iron provides an ideal heating surface.

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prevented from contaminating the comb surfaces. The scraping and sanding methods will be more satisfactory when the weather is cool and the propolis is brittle.

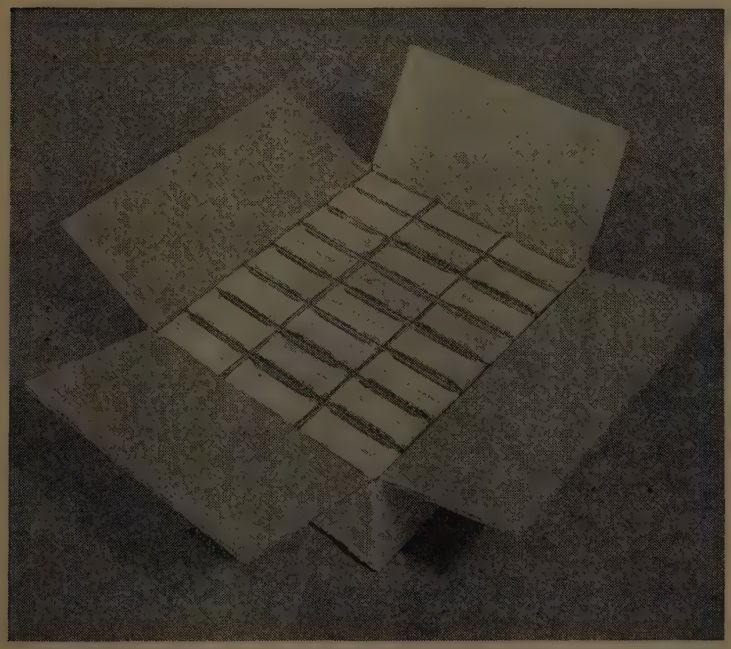
Section honey producers generally wrap each section in either a plain or printed transparent cellulose wrapper. The wrapping used is of a moisture-proof, heat-sealing grade which not only enhances the fine appearance of each section but also prevents the honey from becoming tainted with foreign odours or being soiled before it reaches the consumer.

Grading

Once the sections have been cleaned and wrapped each section should be carefully graded and placed in a pile according to its grade. Grading in this way is essential, as sections vary considerably in quality and weight. Experience has shown that each section for export must conform to a high standard of grading, with a minimum weight of 14oz. and honey of a uniform colour. The honey must also be free from granulation and sufficiently heavy in body to ensure arrival of the sections at their destination with the cappings of the combs dry and free from weeping. The comb surfaces must be clean and free from travel stain and propolis. To avoid bruising or other damage by breakage during transit it is important that a comb surface should not project beyond the wood at any point and that the comb be firmly attached to at least 3in. of the wood surround on each of the four sides.

Sections selected for export are packed into corrugated cardboard cartons. These cartons contain 2 dozen sections packed within corrugated cardboard dividing strips which provide a neat fitting partition for each section. Six of these cartons—12 dozen sections—are then packed into a shipping case. Experience has shown that there is much less risk of damage to packed sections during transit when large cases are used, provided the cartons are well packed with wood-wool. A minimum of 2in. of tightly packed wood-wool at the bottom of the shipping case and 1in. at the sides, ends, and top of the case has proved satisfactory for recent shipments of manuka honey sections.

A shipping case containing 6 cartons of packed sections, showing the method of packing in wood-wool. To complete the packing more wood-wool is placed above the cartons, the lid is nailed on, and the case is banded with metal straps.



[*Sparrow*

An export carton packed with 2 dozen sections wrapped in transparent cellulose. The carton is ready to be closed and sealed with gummed paper ribbon.

The most suitable shipping case is constructed from well-seasoned §in. timber with inside dimensions sufficient only to accommodate the 6 cartons and the wood-wool packing as specified. The case is reinforced with two 2in. x §in. battens on the top, bottom, and each of the sides.

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*12, 13, 14, and 15 June—Taranaki A. P. at New Plymouth.

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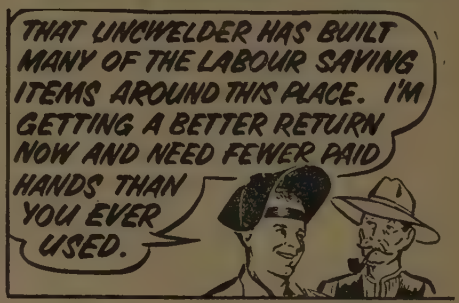
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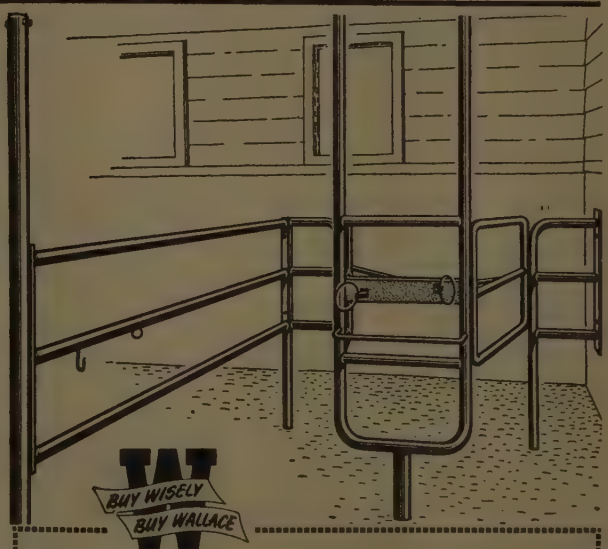

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Trees on the Farm

Planting Trees

GENERALLY the tree planting season begins in May and ends in August, with local variations dictated by climate. This article by W. H. Jolliffe, Extension Forestry Officer, New Zealand Forest Service, is designed to assist those who are intending to plant trees this season.

PREPARATIONS for planting should, of course, be well in hand. The site should be fenced off from stock and vermin; any scrub present should be either clear-cut or have lines cut through it, depending on the amount of protection necessary for the young plants; and arrangements should be made for sufficient tree stocks either by having them grown on the farm or by ordering them well in advance from a nurseryman.

The easiest plants to handle and the most successful in clean country are those about 8in. from the root collar to the tip and with about 5in. of root system. In most parts of New Zealand radiata pine can attain and even exceed this size in 1 year, but many species will take 2 or even 3 years to reach it. Where vigorous competition from weed growth is likely it is advisable to use larger plants.

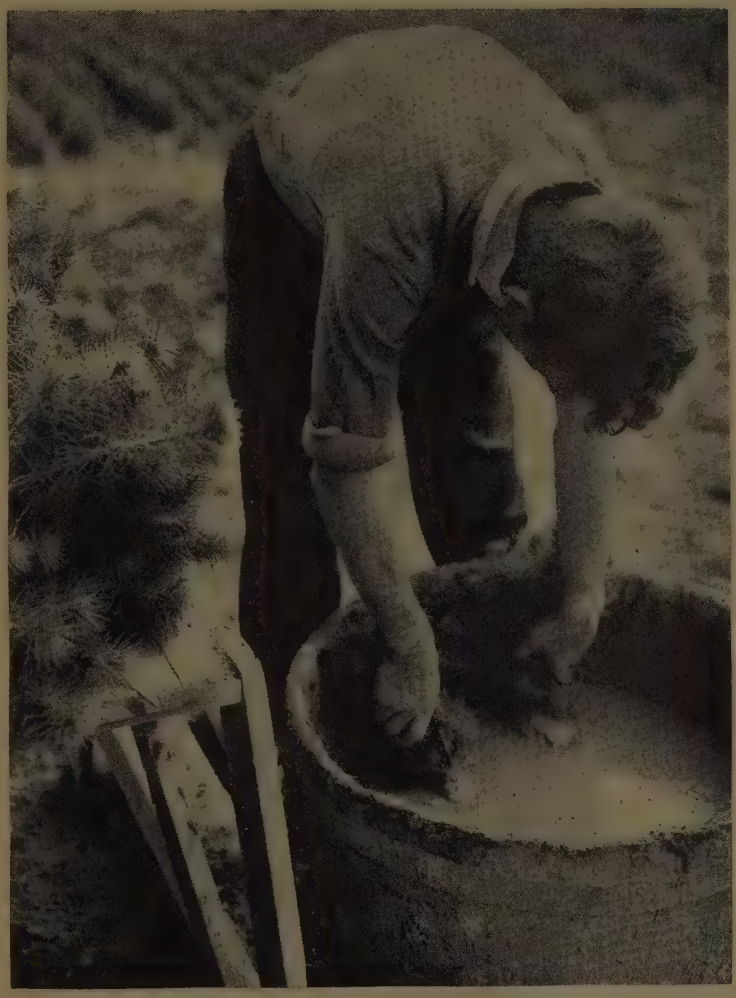
Spacing the Trees

The number of trees required per acre for various spacings between trees and between rows on flat ground are:—

Distance apart in feet	No. of trees per acre
5 x 5	1,742
6 x 6	1,210
7 x 7	900
8 x 8	680
10 x 10	435
12 x 12	302

Spacing will vary according to the purpose for which the trees are grown, to the species, and to the likelihood or otherwise of any later treatment being given. Some species such as radiata pine, larch, most eucalypts, and poplars are intolerant of shade and hence quickly require more space in which to develop properly.

Close spacings (6ft. x 6ft. or less) are generally preferable, because a continuous leafy canopy is formed at an earlier age. This results in earlier suppression of weed growth, the improvement of the climate close to the ground, the early suppression of side branches (which are thus kept small), and the incentive to increased height growth. However, close plantings must be followed by early thinnings to avoid the formation of a forest of tall, thin, whippy trees interspersed with numerous dead or dying ones.



Puddling bundles of young trees in a tub of liquid mud.

Wide spacings (8ft. x 8ft. or over) result in slower formation of a continuous leafy canopy. This means that height growth is not so rapid, though stem diameter growth is increased, and side branches grow unrestricted unless removed by pruning. However, where thinning is not likely to be possible it is better to accept these disadvantages than to have the stagnation of an unthinned, densely packed plantation.

In shelter belts made up of two or three rows the pattern of planting should be "staggered"; the trees in the rows after the first should be planted opposite the middle of the gaps between the trees in the previous row. In larger plantations it is immaterial which planting pattern is adopted.

Planting

The season for planting is generally from May to August, but may be extended either way according to climate. Dry localities will usually favour early planting to catch the winter rains and vice versa.

The main points in planting are to see that the roots are directed downward and not bent unnaturally; to insert plants to the same level they were in the nursery; to fix the plants firmly in the ground and see that the roots are not hanging in an air pocket; and to keep the roots of young trees moist at all times from when the trees are lifted from the nursery to when they are planted in their final situation. Time taken in grubbing away a dense mat of grass and in pulverising the soil to the full depth of the

Planting a tree in a hole made the full depth of a grubber blade.

grubber blade will be well spent. It is much better to plant fewer trees well than a lot of trees poorly. Poorly planted trees may require replacements later.

The best general tree-planting tool is the grubber or mattock. In free soils such as pumice or sand a spade may be preferred, and in very stony land a tool shaped like a spear with an expanded head will be most useful.

Wrenching and Lifting Young Trees

A farmer who has raised his own stock should take care with root pruning and lifting.

Because a long taproot can suffer serious damage during transplanting, it has become general practice to cut it back at a time which will permit the growth of a system of fibrous rootlets before the tree is moved. The operation is known as wrenching and is done by driving in a sharp spade on each side of a band of trees at as flat an angle as possible to cut all the taproots at about 4in. to 5in. below the surface. The spade handle is pressed down to raise the clod of trees clear of the bed and then the clod is let back into its old position by the removal of the spade. This operation is repeated for the full length of each of the bands and is easier if two men do the job.

Wrenching is normally done after a heavy fall of rain 2 to 3 months before planting is intended, but may also be done earlier to check too rapid growth, which would result in unwieldy planting stock.

Lifting is done with a spade, preferably after rain and on an overcast day. After the clod has been loosened the worker lifts it by grasping all the trees rising from it; the soil is then shaken off. The individual trees are then carefully disentangled and, after culling, the good trees are bundled into lots of handy size. In culling care should be taken to reject all poorly rooted plants, those lacking a healthy colour, and those which have no definite leading shoot. It is better to lose plants at this stage than after labour has been spent on planting out unthrifty stock.

As an additional precaution before the bundles are heeled in in a sheltered place their roots should be puddled in a mud bath about the consistency of gruel. It is imperative that plant roots be kept moist from the time of lifting until the plants are planted in their permanent location.

New Zealand Perennial Ryegrass in Scotland

A TRIAL of interest to New Zealand seed producers has been carried out over 3 years at the West of Scotland Agricultural College and is reported in the "Journal of the British Grassland Society" (March and September 1956 issues).

The trial, reported on by I. V. Hunt of the College staff, comprised replicated plots of various strains of perennial ryegrass, timothy, cocksfoot, and meadow fescue, and single strains of tall fescue and rough-stalked meadow fescue, each sown with white clover at 1lb. per acre. In summarising the results of the trial, the author wrote: "The outstanding grasses of the trial are New Zealand perennial ryegrass and tall fescue". He went on to say that with the former grass the results are readily applied in practice, but that the wide use of tall fescue is beset with many problems, including poor establishment and low palatability.

In the first year of the trial, in which the growth was measured as hay followed by two aftermath cuts, New Zealand perennial ryegrass significantly outyielded S.23 perennial ryegrass and all cocksfoot strains and was not outyielded by any other strain.

In the second year, when five cuts were taken during the growing period, New Zealand perennial ryegrass was again the highest yielder, significantly so except in comparison with four other perennial ryegrass strains.

In the third year of the trial, with production again measured by five cuts at about monthly intervals, tall fescue gave the highest yield. Though in this year New Zealand perennial ryegrass fell to twelfth place (of 27 strains) in dry matter yield, only tall fescue gave a significantly higher yield.

Though the results of this trial may not be applicable under New Zealand conditions, they do indicate a place for New Zealand perennial ryegrass in the West of Scotland, where, in the words of the author, referring to this trial, ". . . the best grass is undoubtedly New Zealand perennial ryegrass. . . ."

—*J. H. CLARIDGE,*
Superintendent of the Seed Industry, Department of Agriculture, Wellington

Guide Line Mole Drainage of Rolling Clay Downs

By K. L. MAYO,
Instructor in Agriculture (Field Drainage), Department of Agriculture, Palmerston North

Fig. 1—Abney level. This level reads the degrees of slope and for this reason can be set and a constant grade pegged in as shown in Fig. 2.

LARGE areas of rolling downs throughout New Zealand have a tight clay subsoil. Though the fall in this country is visible to the naked eye, the land becomes very wet during winter, especially where the fertility has been improved with a consequent increase in the depth of the topsoil or humus layer. The impervious clay subsoil prevents free drainage and the topsoil soaks up water like a sponge to produce a "perched" water-table. These soils also dry out badly in summer and as a result of these two extremes they revert to browntop pastures. The use of lime and manures does not always give good responses. The efficient field drainage of these areas with mole systems combined with a reasonable use of lime and manure can, however, readily change them into high-producing farmland.

MOLE draining not only has a beneficial effect as drainage; it also has a subsoiling effect and allows air to circulate through the soil. These improvements ensure that high-producing pastures are maintained on this land. The dung and urine cycle is put into motion as more food is grown and more stock is carried, with the result that the topsoil or humus layer is built up, and this in turn reduces burning off during dry summers.

Unfortunately, drainage of this country presents one of the most difficult field drainage problems. When good outlets for mole drains are possible with the installation of tile drain mains at grade changes, and terminals, and the slopes are continuous or increase slightly toward the outfall, the job is relatively easy. However, the profile of this type of country is usually very different and consists of short slopes, long slopes, and steep sidelings, and the whole can be broken up with local identations. The sidelings usually flatten off as the outlet is approached, too.

With such physical outlines draining becomes bewildering and particularly difficult without specialised knowledge, the use of surveying equipment, and a working experience of the technique used to drain this type of farmland.

Technique of Draining

(a) Inspection of the Area

Before the planning of drainage systems is attempted a thorough inspection must be made of the area. The subsoil should be examined at numerous places to ensure that it is suitable for mole drainage. Any rock, sand, or shingle outcrops and ironstone formations must be located. Ironstone formations will usually be found round the head of local identations (re-entrants) and gullies and along the sides of them.

In some areas sandy layers are encountered on the sidelings and it is most necessary to peg off these outcrops carefully so that mole drains do not cross them, as slips can result.

Potential outfalls should be noted and where necessary developed to permit tile drains to empty into them at the required depth. The tile drains must not become submerged at the outfalls during normal winter rains.

(b) Planning and Pegging out the System

The actual drainage of moleable clay soils is done by the mole drains. Tile drains are installed only as mains to carry the water from the mole channels to the outfall ditches or watercourses.

Once a decision has been made to drain the area the systems should be pegged out about a fortnight before work begins. It will be obvious to the experienced where some of the tile drains will be required, but until a pattern of guide lines for the mole draining is pegged out over the whole area the positions of all the tile drain mains will not be known.

The guide lining of this type of country is the clue to its drainage, and mole drainage to cover the whole of each area cannot be carried out without the use of guide lines. It is impossible to pull mole drains on constant and known grades without them.

If the grade of the land is steeper than 1ft. in 40ft., moles should be pulled across the slope on grades not

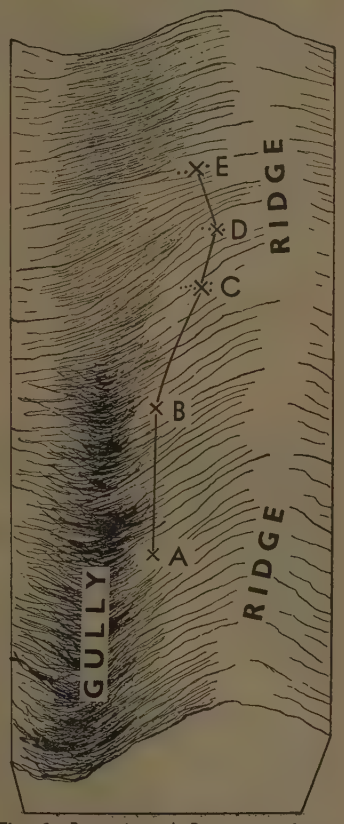


Fig. 2—Pegs A and B are put in on grade, say, 1ft. in 30ft. To proceed from this point the assistant moves forward another ½ chain to ¾ chain and holds up the Abney pole with the disc on it at that point which he thinks is on grade. At the same time the person with the Abney level moves forward to peg B and sights on to the disc once more and then moves his assistant up or down the slope until he is on grade. Once this has been accomplished the whole procedure is repeated. The dots on the diagram beside pegs C, D, and E show where the assistant may have held the disced Abney pole and the Xs where he was moved to.

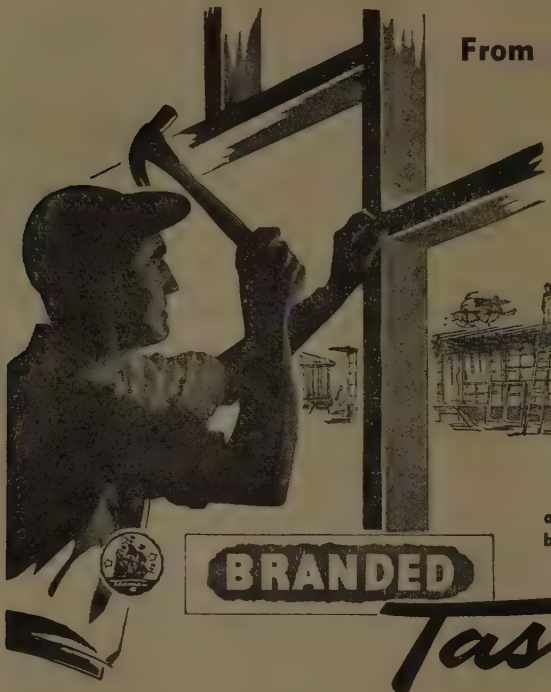


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Fig. 3—Pegging in guide lines. Left—Guide lines being pegged in. The white lines join up the pegs on the course the mole channel pulled through the line of pegs will take. The next guide line down the slope has also been outlined in white. Right—This is a different view of the two guide lines at left and shows how the lines twist or meander through small "bays" and round spurs to maintain a constant grade. Pegging through these irregular features of the sideling must be done at shorter intervals so that the actual course pegged follows round the bays and spurs and not through them.

exceeding 1ft. in 20ft.; for with grades of 1ft. in 10ft. to 12ft. the possibility of erosion or scours in the mole channels is very real.

Guide lines are lines of pegs placed on a grade determined with an Abney level (see Fig. 1) and followed and paralleled with the mole plough. The grade can steepen within the limits set out above toward the outlet and flatten off toward the source. The actual line or course pegged will curve or meander, but the curves must be gentle enough to permit a mole plough to be pulled through them.

The grade which is used on a particular face is governed by the steepness of the face. The grades most commonly used are 1 in 30 to 45, but on steep faces grades of 1 in 20 to 30 are often necessary. Sometimes the grade will be flattened off to 1 in 60 for a chain or so on the tops or source.

The profile of the face or sideling dictates the number of guide lines it will be necessary to peg across it, but it is better to have too many than not enough. Pegging is done by two persons, one with an Abney level and an Abney pole to rest the level on and the other with an Abney pole with a disc fixed to the top of it and a bag of pegs.

The best place to start is half-way along a face and about half-way up it. Pegging can proceed either up grade and then down or vice versa. The person with the Abney level, having picked the approximate line through which he wants the guide line to run, sends his assistant half to three-quarters of a chain away and sights on to the Abney pole (see Fig. 3) and reads off the fall. From this reading and his own experience he then adjusts the Abney level to read a certain fall (say 1ft. in 30ft.) and then sights on to the pole held by his assistant once more and moves him on to grade. They proceed to peg the guide to the source or outlet as illustrated in Fig. 2. The guide line is completed to both source and outlet and then the other guide lines are pegged in roughly parallel to this one until the whole face is sufficiently covered with them to permit it to be mole drained.

Pegging is done at ½ to ¾ chain intervals, except round a spur and through a bay, where the distance is shortened to ensure that the grade remains accurate (Fig. 3, right). If long sights are taken at such places, the grade would flatten off, because the course the mole plough will take is round the bays or spurs and not through or across them as is possible with a line of sight.

The usual places where tile drain mains are required are grade changes, narrow bays, or gutters which it is impossible to mole drain across while retaining accurate grade, and round sand, shingle, or ironstone outcrops.

Mole drains work effectively only where there is sufficient fall in relation to their length. Where the fall is less than 1ft. in 50ft. mole drains must be short and tiles may be required on large, flat tops. Limits of length of mole drains in relation to fall are given below.

Fall	Length of mole drains
Less than 1ft. in 100ft. ..	2 to 3 chains
1ft. in 100ft. to 1ft. in 60ft. ..	3 to 5 chains
1ft. in 60ft. to 1ft. in 50ft. ..	5 to 8 chains

Tile drains may be required also to provide an outlet for the mole drains on flat tops on an area where it is impossible to bring the mole drains down the face because of insufficient room, its steepness, sand or shingle outcrops, or other reasons.

Occasionally after practically the whole area has been pegged with guide lines the system planned will

Fig. 4—Pegging in guide lines, with a terminal tile drain as an outlet. This illustration shows how the guide lines turn to run across the slope as the fall of that slope becomes too steep and also how the mole drains will have to be squeezed between the guide lines to allow the mole drains on the flattish top to be brought down to the outlet.

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not be found possible and it is necessary to modify or change it completely. When this happens all the pegs should be gathered up and a fresh start made.

Fig. 5—Use of major moles. This → is an area where major moles will be used as the outlets instead of tile drains. The double lines denote the major moles, which were pegged in on a fall of 1ft. in 15ft.; the guide lines have a fall of 1ft. in 30ft. If the major moles were pegged in to run the same way as the guide lines, they would run too nearly parallel to them to pick up many minor moles. The illustration gives an idea of the large number of outlets required when major moles are used. Only ⅛ acre should be emptied into them.

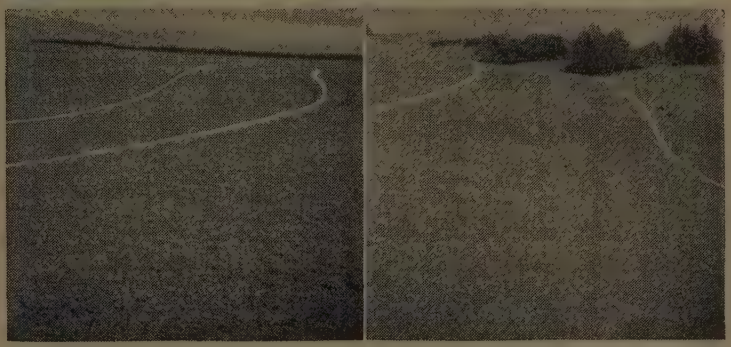

Fig. 6—These two illustrations are of → the same area, but looking down the grade at left and up the grade at right. A mole drain has been pulled through two adjoining guide lines. The pulling of the mole drains will proceed from this stage by the filling in of the area between these two guide lines and then pulling another guide line either higher up or lower down the slope and filling in the area between it and this area.

The grade in the guide lines will usually run with the general fall of the country, that is, the general direction that the water flows in the creeks in the area.

(c) Special Points

Steep sidelings (Fig. 8) which are broken by re-entrants or small gullies require tile drain mains up them because they are too steep for major moles to be used (Figs. 12 and 13), and it is not always possible to mole drain through them on grade because of the sharpness of the turn.

The fall in these tile drain mains will sometimes be so steep that the water will run down outside the pipes and cause "under-runners" to form. To overcome this bell-ended pipes have to be used with the bell ends facing up the grade. The machine used to cut the trenches for these tiles must cut a narrow trench, as otherwise too much soil is disturbed and the chance of scouring occurring is increased. When bell-ended pipes are unprocurable the only alternative is to put in special impervious concrete stops to prevent the water from flowing down outside the pipes. Three-inch diameter pipes are quite suitable for these drains and help to keep costs down.

When the main tile drain from a system on a flat top has to be taken down a steep sideling to the outlet watercourse or ditch two alternatives are possible:—

1. It can be emptied out beside a fence into a narrow grassed runway formed by removing two spits with a spade and replacing only the turf to form a narrow grassed gutter. This work must be carried out in spring to allow the grass to take root to resist scouring by the following winter.

2. It can be continued down the slope to the final outlet by using a closed, non-porous pipe such as polyethylene or sewer pipes cemented together.

(d) Use of Major Moles

Major moles (Fig. 5) are used as mains which gather the water from an area of the ordinary or minor moles. They can be used only where

Fig. 7—An area with only two mole channels pulled through consecutive guide lines.

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Fig. 8 (left) and Fig. 9 (right)—The next stage of filling in between the guide lines partially completed on two different areas. In Fig. 8 all the guide lines have had mole channels pulled through them to avoid losing the pegs, and to save too much sharp turning a number of areas between guide lines is being worked out at one time.

outfalls and conditions of fall suit. Another reason which precludes their use in country suited to them is that only ⅛ acre can be emptied into each major mole and this necessitates numerous outlets, which must be maintained.

As most areas have a tendency to flatten off adjacent to the outfalls, the use of major moles results in their being emptied out at the foot of this slope, which may be in the middle of the paddock. In these situations major moles are quickly damaged and blocked by stock, and when cultivation is undertaken they are lost. Very wet areas then develop because the water continues to flow to these points but cannot get away.

Even when the outlets are kept clean, and very few farmers will go to enough trouble to do so, the water emptied out makes the area below even wetter than it normally is.

In many areas it is impractical if not impossible to conduct the water off flattish tops with major moles, because the fall is too flat for moling without the use of tile drains to provide outlets at correct distances in relation to fall.

The use of major moles entails more time and labour every time moling has to be repeated, because these majors have to be pulled again each time and then opened up with a spade and a protection built about them. With labour more important than finance on farms today farmers find they cannot afford to use this method, but prefer to install tile drain outlets, which with proper maintenance will be there for all time.

(e) Mole Draining the Area

The pulling of the moles is the biggest job. The person who pegged out the system should guide the tractor driver the whole time, because he has a full picture of the completed job in his mind and therefore knows where to squeeze or spread the moling.

A start is made by pulling the first mole through a guide line and returning via the next one. The area in between can then be worked out by paralleling these and slowly conforming one to the other. To do this it may be necessary to squeeze the moles in as close as 4ft. to 5ft. at the outfall or about spurs and spread them out to 10ft. to 15ft. at their source. Because some areas of the paddock cannot be moled until the adjacent area is completed, it is necessary to foresee this and to do such an area first so that the other can conform to it (Figs. 6, 7, and 10).

Each area between the guide lines must be worked out as a unit, even if a start is made to open up other areas to facilitate turning (Fig. 8), because it is particularly important that the area midway between the two guide lines should conform partly to both guide lines. If the area between the guide lines is not worked out in this way, the moling will conform to only one of the guide lines.

When it is necessary to squeeze the moling, to cover a large area high up the slope where the moling is spread out, some of the moles will stop at the first outlet, a tile drain (Fig. 10), so that those which continue are at the usual or required spacing of 6ft. to 7ft. apart.

Points to Watch

A great deal of experience is needed to plan and direct the work described, and first attempts are seldom satisfactory. Fortunately, confidence grows, and the eye becomes experienced at visualising the completed system on each area.

On occasions while moling an operator cannot see where he is getting to and will become anxious about the squeezing and spreading. As soon as this happens he should stop the tractor for a few minutes, do some measuring, and with the ranging poles mark any points which will help in squeezing and spreading.

Small points which at first do not seem clear are learnt as the operator does more work. One of these minor problems is encountered when a slope of about 1ft. in 50ft. which increases to perhaps 1ft. in 10ft. to 12ft. higher up is being moled. The moling will run straight up the slope for a start and then turn across it to maintain the grade of 1ft. in 50ft. As the moling changes direction many of the moles will finish and only a few continue across the slope (Fig. 15). This has to be done because there is not as much area at the desired level in the diagonal plane as there is in the near-horizontal plane. For example, a width of ½ chain between the two outside moles where they cross the slope, measured at right angles to the direction that the moles run, must widen out to much more than ½ chain when those two outside moles change direction to run down a comparatively flat area.

Fig. 10—This diagram illustrates why it is necessary for the tractor driver to have a person guiding him and why that person must be the one who planned and pegged out the system. In this diagram, which is based on a paddock which was drained, it was necessary to begin mole draining on the right side and work toward the left, because until this had been done it was not possible to tell how far up the paddock the mole drains on the left would run (area X). If the mole draining had not been done in this manner, some of the area near the top of the mole drains (area X) beside the left boundary of this paddock may not have been fitted into the pattern of the mole draining, because the area closer to the outlet had already been moled. The diagram also illustrates the drainage of a large area YZ by fanning and squeezing the mole drains to the tile drain L3. Many of the mole drains stop at the tile drain main L3 and the rest continue down the paddock at the usual spacing. This squeezing enabled the whole of area YZ to be mole drained and kept the tile requirements to a minimum. The tile drains illustrate further points. Drains L2, L3, and L4 are all at the foot of a grade change where the fall flattens off and breakdown would occur if the mole channels were not emptied of the water they are carrying. Drain L1 limits the length of the mole channels relative to the fall on a very flat area.

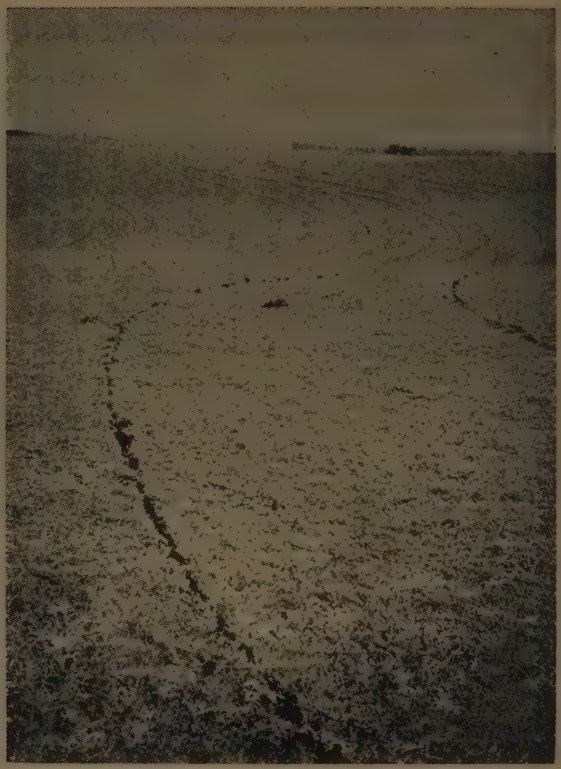

Fig. 11—This illustration shows the filling in between guide lines carried a stage further. Squeezing and fanning had to be done and one mole channel finishes half-way up the slope.

Fig. 12—Filling in between all the guide lines almost completed. A number of shorter mole drains will be required to finish the area off, but they will have an outlet in the form of a tile drain in the hollow. This hollow was one place where a tile drain to provide an outlet main was necessary to permit the area to be drained. It was not possible to pass through this hollow on grade because a turn which it was not possible to execute with a tractor and mole plough would have been necessary.

Figs. 13 (left) and 14 (right). Fig. 13—The same area as Fig. 12 only looking up grade. The illustration shows another reason why a tile drain outlet (A—B) or main was required to enable this area to be mole drained. The area at present to be mole drained lies between two guide lines which are only a few feet apart on the sideling just beyond the tractor. Because of the physical outline of the country, however, they do not run parallel and a large area balloons out between them. The only way in which this area could be mole drained was by providing a tile drain outlet. Another factor which made it necessary to install tile drains up the course of both of these re-entrants or local indentations was that they were too steep for major moles. Fig. 14—An area completely mole drained. It is possible to get a vehicle on to the area when ground conditions are suitable for mole draining.

The opposite happens on flat tops; hence the need to install tile drain outlets on to these tops in some places because there is insufficient room for all the moles to continue down the sidelings.

When a sideling flattens off toward the outlet it is essential that the mole drains be made to turn down the slope without flattening off. They should, therefore, turn inside the moles which run only to the change of grade of the slope (that is, the higher side). This calls for careful planning when the moling is being done, so that the moles do turn without flattening. The use of numerous guide lines across the lower slope will be found most helpful.

The slurring or squeezing of corners on the outside of the curve and the spreading of them on the inside as the plough moves away from each guide line is another point to watch, as it prevents the corners from becoming sharp and flattening off.

Once moling begins, directing the tractor driver becomes a full-time job. The person in control has to foresee all the little points like those just pointed out, be at least "two moves" ahead of the tractor driver, and anticipate any mistakes he may attempt to make. To do this the person in charge must plan in his mind the direction of pulling for about the next three phases all the time, with a view to preventing sharp turns or continuous turning on one track, which will cause undue wear on the track assembly.

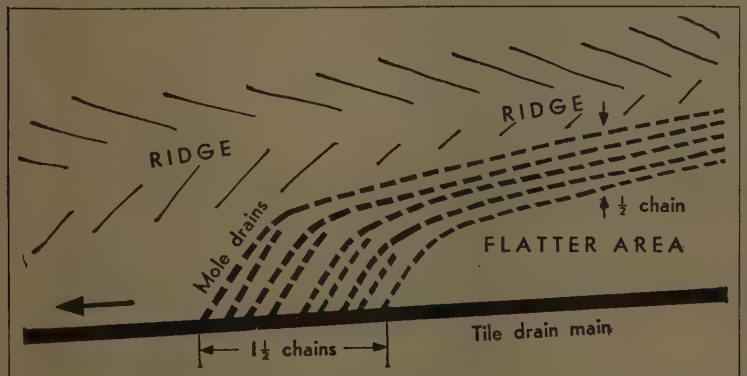

Fig. 15—Mole draining a flat which has good natural fall of, say, 1ft. in 50ft. but which ends in a sideling with the fall gently increasing to about 1ft. in 10ft. to 12ft.

It is most necessary to have a tractor driver who works exactly to instructions and who will stop if he is at all uncertain of where to go next should the person directing the work be preoccupied for a few moments (probably measuring up the area still to be done). Few tractor drivers understand the function of a mole plough and most treat it as they would a cultivation implement.

Special care must be taken to see that the mole plough is not let into the ground too soon, so that it cuts mole channels already pulled when the tractor is crossing them "empty" and straightening up to pull the next mole. The same precaution must be taken where the fall changes on the top of a rise. Mole channels cut about by one another make a very wet area.

Costs

Because clay downs country varies so much, the cost of one job would not be a yardstick for others. The cost of a number of jobs which the writer completed in Southland, where the cost of tiles may vary from other parts of New Zealand, was £10 to £12 per acre (2½ chains to 3 chains of tiles per acre at £3 10s. to £4 per chain, depending on size of pipe used; moling 35s. to £2 per acre). The cost of mole drainage also varies with the power unit used, the length of runs, and the pattern.

Distance from tile works affects cartage costs, which in turn affect cost per chain. Field tiles are more expensive in the North Island than in the South Island and contract rates for moling are higher. Tile drains can cost £4 to £5 per chain and moling as much as 45s. per acre.

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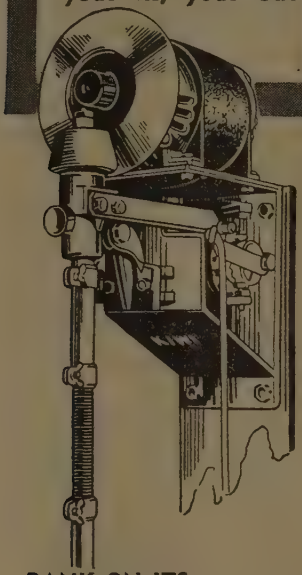

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The Danger of Overdraining Peat Soils

By F. C. C. HUPKENS VAN DER ELST,
Research Officer, Department of Agriculture
Rukuhia Soil Research Station, Hamilton

IN the past many farmers have been attracted by the possibility of developing peat soils, largely because such areas could be bought cheaply. Perhaps many tended to overlook the fact that developing and maintaining this sort of land at a reasonably high level of production involve more than clearing the native growth, preparing the soil, and topdressing it with lime, phosphate, and potash.

PEAT soils are vastly different from mineral soils, as they are built up from organic material which contains only a small fraction of stable mineral matter. All this organic material is subject to changes as soon as the water-table is lowered and air takes the place of water in the deeper soil layers.

The organic matter in these soils is preserved by the presence of acid water where air is excluded. In many cases no changes have taken place for hundreds or even thousands of years. The capacity of these conditions to preserve organic matter was clearly demonstrated some years ago when two human bodies were found in a bog in Denmark in perfect condition after having been drowned 2000 years ago.

When these conditions are interfered with by drainage, air takes the place of water and the organic material starts to decompose, resulting in extensive changes in the original material. Some of these changes and their effects on the soil are briefly discussed in the following part of this article.

Moisture in Peat

First, peat will shrink purely through water removal and drying, and the initial loss in surface elevation immediately after draining is largely caused by this factor and the loss of buoyancy through the lowering of the water-table. Secondly, further loss of surface elevation is caused through mechanical compaction or consolidation through the passage of implements and tractors or by the trampling of stock. The greater the lowering of the water-table by drainage is the greater will be the loss in elevation from all causes. The third factor important in this process is the slow oxidation or "burning" of the peat due to biochemical processes.

Before cultivation most peats have practically the same density from top to bottom, but gradually the density of the top increases. Through cultivation and decomposition the top layers change into a mass without definite

A deep main drain in peat country cutting through a layer of coarse sand. Blocking of shallow side drains in summer was successful until the water level in the main drain dropped below the coarse sand layer, when water levels in the side drains could not be held any more and went down rapidly. The layer of soil between the spade and hand is not so pervious and holds moisture fairly well. However, water moves very freely through the coarse layer underneath.

Topsoil (left) of overdrained peat soil. It has lost its crumbly structure altogether. The soil is now fine and dusty, as can be seen from that on the paper bag. Only poor grasses such as browntop grow on this type of peat. The dark lump of crumbly soil at right comes from an area of peat which is not overdrained. Water uptake and pasture production on this type of soil can be much better.

structure. Its fibrous structure disappears and the density increases, the colour darkens, the seepage rate decreases, and the topsoil is transformed into a mucky condition. As drainage continues the rate of subsidence levels off to a more or less steady rate, depending on water levels.

The moisture content of peat has a marked influence on its rate of decomposition. Control of the amount of water in peat also controls the speed of decomposition. There is an optimum amount of moisture above and below which the speed of decomposition of peat is reduced. No changes occur when the moisture level becomes too high. Soil structure remains unchanged, as it is preserved constant through the exclusion of air. This situation is, of course, not favourable for plant growth and results in a setback to pasture species. No serious damaging effect, however, occurs when drainage improves within reasonable time, and good growth can be restored.

When the other extreme occurs and the peat is too dry decomposition is stopped through lack of moisture in the soil. These conditions occur during dry summers. Plant growth is retarded and eventually comes to a halt. The seriousness of this effect on plant growth will depend on the duration of the dry period. The effect on the soil, however, is quite different. Soil particles, when they dry out thoroughly, are changed into a new material with physical properties very different from those of the original peat.

Loss of Ability to Absorb Water

The property of water absorption after drying can be lost to such an extent that moisture cannot again be taken up by the soil particles, which may remain dry even during heavy rainfall. If mixed with water in a bucket, the peat will float on top without getting wet. The best that can be achieved under these circumstances is that moisture eventually fills the gaps between the dry soil particles and this is the only moisture available for plant growth. These new soil particles are lumpy and hard and angular when rubbed between the fingers. After a wet winter they will be found apparently unaffected by moist conditions.

In other instances a layer of dusty, fine, dry material is formed on top of the soil. This layer can be several inches thick and is very resistant to wetting. Heavy rainfall will result in wetting only the surface, while further down the peat is still dry and dusty. It is not uncommon to find layers of dusty dry peat when these soils are ploughed in spring after a period of heavy winter rains. Rain-water moves over the top of these soils toward hollows in the paddock, where it usually moves down through cracks that were formed in deeper soil layers. The most important soil layer just under the soil surface where most feeding roots of the pasture can be found is not wetted properly, and pasture growth on these soils is for that reason very poor.

Rewetting Soils

The only way to rewet these soils is by raising the water-table and forcing water into their dry top layer. Spring growth on most dry peats is reasonably good, but they are soon affected by a short period of dryness and summer production is mostly poor; recovery in autumn is slow and often only just enough to make the pasture look green by the time winter arrives.

All this trouble is due to overdraining, and once this stage is reached it is very hard to improve the soil without radical measures that can be very costly.

For these reasons it is advisable to avoid overdrainage under all circumstances. Many shallow drains are better than a few deep drains. If a farmer finds deepening of a drain essential, he should make sure that the water-table in the drain is high during that part of the year when damage through overdrainage can be expected.

Most harm is done by deep drains cutting into layers of sand under the peat. This layer drains moisture out of the peat lying on top and removes water all the year round. These drains particularly must be kept full of water in summer, either by pumping it back or by blocking the drains early enough in the season to avoid heavy losses of pasture production and soil productivity.

It is not uncommon to see quite a lot of water running down drains in peat during dry summer months, when there is no necessity for drainage. Water removal at that time of the year is like draining the blood from the veins of a stricken man. Soil, air, and moisture have to be in balance for maximum plant growth, and an effort should always be made to keep this balance, particularly on peats, where the maintenance of a productive soil depends so much on adequate soil moisture.

Quickbreads

By MAUD B. STRAIN,
Field Officer in Rural Sociology,
Department of Agriculture,
Dunedin

QUICKBREADS are not difficult to make, success depending rather on the quality of the ingredients, the method of mixing, and the patience to measure quantities accurately than on any profound knowledge of cookery. The varieties that are possible in flavours and textures make quickbreads always interesting, and they are an appetising and nutritious addition to any packed lunch and a pleasant accompaniment to the mid-morning cup of tea.

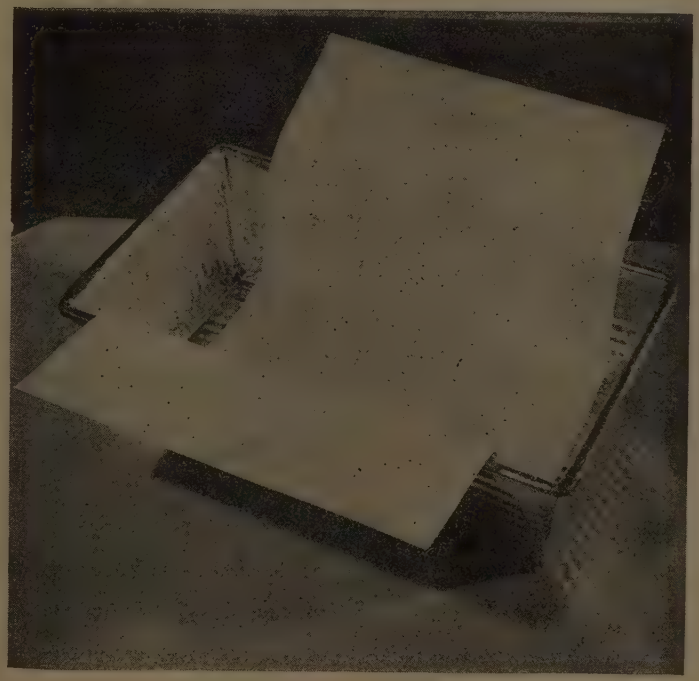
Quickbreads may be baked or steamed. The nut bread at left and the raisin bread at centre were baked; the banana loaf at right was steamed and then browned in the oven.

AS their name implies they are breads made with a leavening agent which acts quickly, enabling them to be baked at once. Success with the plainer mixtures depends largely on the mixing. Because they rise only once, as opposed to yeast bread, which is set aside two or three times to rise, any gluten which develops has no opportunity to stretch and become tender. Mixing is therefore reduced to a minimum. Usually the dry ingredients and the liquid ingredients are mixed separately. The fat is melted and combined with the liquids, which are then added all at once to the dry ingredients and stirred only until all the dry ingredients are dampened. Overmixing results in a product that is tough, heavy, and of uneven grain. In richer products with more fat and sugar these ingredients tend to prevent toughness and the effect of overmixing is less apparent.

Some recipes require both baking powder and baking soda. This combination of raising agents is found in recipes with some ingredient, such as golden syrup or honey, which has an acid reaction. This acts on the baking soda and frees carbon dioxide gas in the same way as liquids act on baking powder. If baking powder and baking soda are both used, the amount of baking powder is less than if it was used alone.

Variety can be obtained in quickbreads by the use of different cereals such as wholemeal, oatmeal, or bran to replace part or all of the flour. The products are characterised by the

▼ A strip of greased paper provides leverage and support to lift the loaf out of the tin.



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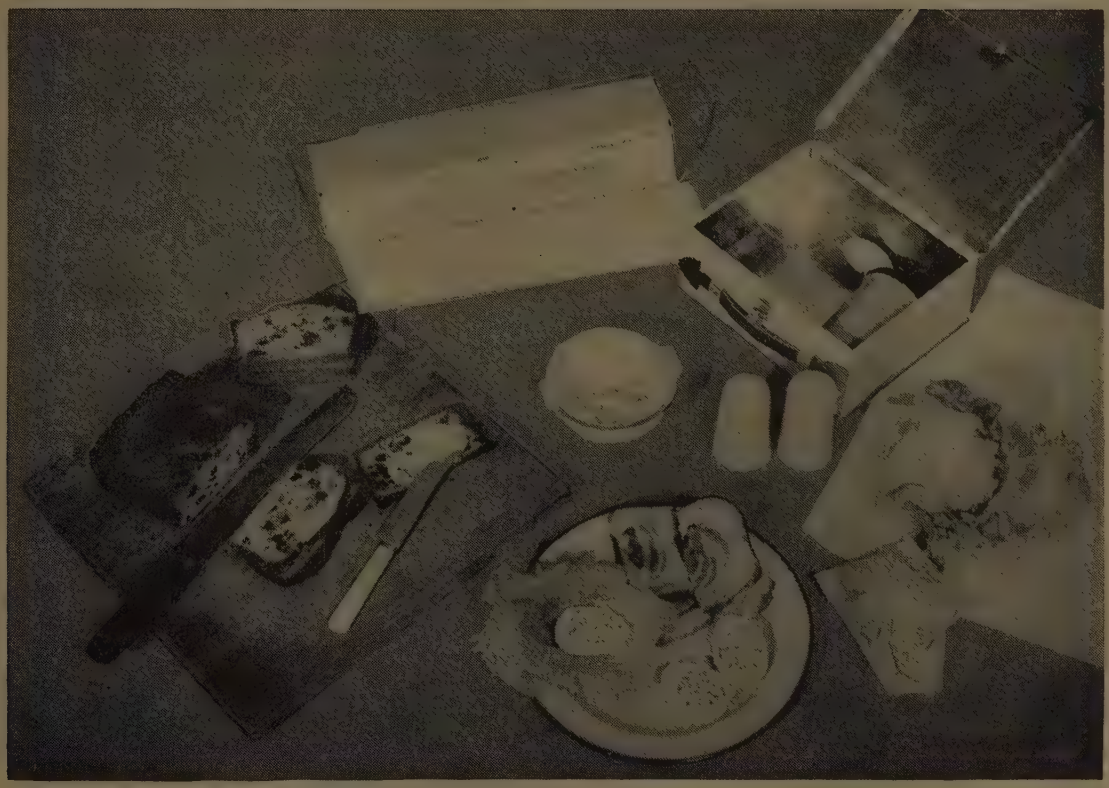

The great variety possible in quickbreads is appreciated by those who must regularly take their lunches with them.

cereal used and are all dissimilar. Dried fruits and nuts which may also be used, alone or combined, are those such as raisins, sultanas, currants, dates, figs, soaked prunes, apricots, peaches, crushed pineapple, bananas, walnuts, cashew nuts, and almonds.

Loaves may be baked or steamed. If they are steamed, a tin with a well-fitting lid should be used, and at the end of the steaming time the lid may be removed and the loaf browned in the oven.

Preparation of Tins

Medium-sized loaf tins are most satisfactory, as too large a tin lengthens the cooking period and this tends to dry out the loaf. The tin should be well greased. An added precaution against sticking is to place a strip of greased paper from one side across the bottom and up the other side of the tin, extending just a little above the edges. This gives leverage and at the same time support to lift the loaf out of the tin after it has cooled but is still soft and easily broken.

Recipes

In these recipes standard measuring cups (8 fl. oz.) and standard measuring spoons are used. All measurements are level.

Nut Loaf

8oz. of flour
½ teaspoon of salt
4 teaspoons of baking powder
½ cup of chopped nuts
5oz. of sugar (white or brown)
1 well-beaten egg
1 cup of milk
1oz. of melted butter

Sift the flour, salt, and baking powder together and add the nuts. Add the sugar to the beaten egg and beat again. Add the milk and butter to the egg mixture. Add the liquid ingredients to the dry ingredients and mix until the dry ingredients are dampened. Pour the mixture into a well-greased tin and bake in a moderate oven (375 degrees F.) for 1 hour.

Wholemeal Loaf

1½ cups of flour
1½ cups of wholemeal
1¼ cups of milk
4oz. of brown sugar
1 egg
1 teaspoon of salt
6 teaspoons of baking powder
1oz. of melted butter
1 cup of fruit or chopped nuts (optional)

Sift the flour, salt, and baking powder into a bowl. Add the wholemeal and the brown sugar, which must be free from lumps. Mix in the fruit or nuts. Beat the egg and add the milk and butter. Add these to the dry ingredients and mix until the dry ingredients are moistened. Allow the mixture to stand in the loaf tin for 15 minutes before baking it at 350 degrees F. for 1 hour.

Oatmeal Loaf

In the previous recipe use 1½ cups of oatmeal in place of the wholemeal, and fruit in place of the nuts.

Bran Bread

1 cup of bran
1 cup of wholemeal
1 cup of flour
3 teaspoons of baking powder
½ teaspoon of soda
1 teaspoon of salt
2oz. of sugar
1 well-beaten egg
1 cup of milk
½ cup of boiling water
¼ cup of treacle
½ cup of raisins

Sift the flour, baking powder, soda, and salt. Add the wholemeal, bran, sugar, and fruit and mix well together.

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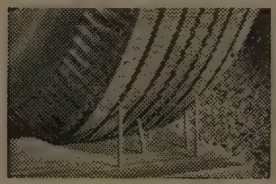

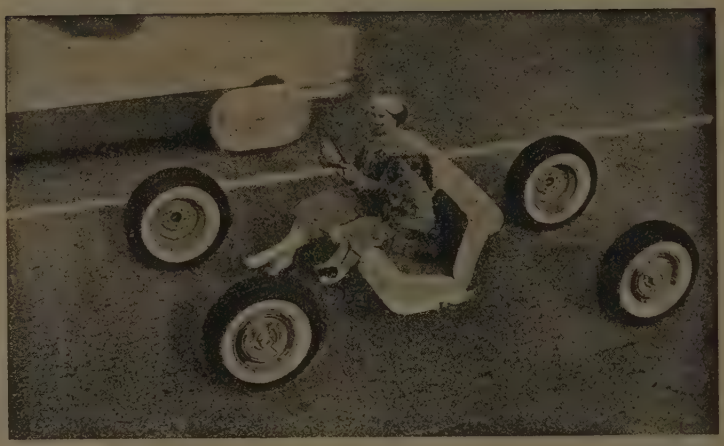

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Combine the liquids and add gradually to the dry ingredients. Bake in a well-greased loaf tin for 1 hour in a moderate oven (375 degrees F.). The mixture is sufficient for a loaf 3in. x 4½in. x 10in.

Nut and Sultana Loaf

10oz. of flour
2 teaspoons of baking powder
1 egg
1oz. of melted butter
4oz. of sugar
½ cup of cleaned sultanas
½ teaspoon of salt
1 cup of milk
½ cup of chopped walnuts

Sift the flour, sugar, baking powder, and salt into a bowl. Mix in the sultanas and nuts. Beat the egg and add the milk and butter. Add the liquid ingredients to the dry ingredients and mix until the dry ingredients are dampened. Put the mixture into a well-greased loaf tin and bake at 350 degrees F. for 1 hour.

Date and Walnut Loaf

1 cup of chopped dates
1 cup of boiling water
½ teaspoon of baking powder
2oz. of butter
1 beaten egg
½ cup of walnuts (pieces)
1 teaspoon of baking soda
8oz. of flour
½ teaspoon of salt
4oz. of sugar
½ teaspoon of vanilla

Sprinkle the dates with the baking soda and add the boiling water. Cover and cool. Sift the flour, baking powder, and salt together. Cream the butter, add the sugar, and cream again. Add the egg, vanilla, and date mixture, then the flour mixture gradually, and finally the nuts. Bake in a well-greased loaf tin in a moderate oven (350 degrees F.) for 1 to 1¼ hours.

Fig Loaf

12oz. of flour
6 teaspoons of baking powder
1 cup of chopped figs (or any dried fruit)
1½ cups of milk
1 teaspoon of salt
4oz. of sugar
1 beaten egg
1oz. of melted butter

Sift the flour, salt, and baking powder. Add the sugar and the figs. Add the butter and milk to the egg. Add the liquid ingredients to the dry ingredients and mix until all the dry ingredients have been dampened. Bake in a moderate oven (350 to 375 degrees F.) for 1 hour.

Wholemeal Fruit and Nut Bread

½ cup of chopped dates
½ cup of chopped nuts
3 teaspoons of baking powder
½ teaspoon of soda
2oz. of brown sugar
½ cup of honey
1½oz. of melted butter
½ cup of chopped figs
6oz. of flour
½ teaspoon of salt
1½ cups of wholemeal
1 beaten egg
1½ cups of milk
1½ teaspoons of grated orange rind

Mix the prepared fruit and nuts with 2 tablespoons of flour. Sift the remaining flour with the baking powder, salt, and soda and into these mix the wholemeal. Add the brown sugar gradually to the egg and beat it well in. To this mixture add the honey, milk, butter, and grated orange rind. Add the liquid ingredients to the dry ingredients (without the fruit and nuts), mixing only enough to dampen the dry ingredients. Stir in the fruit and nuts. Pour into a prepared loaf tin and bake at 350 degrees F. for 1¼ hours. Cool thoroughly before slicing. This makes one large loaf or two small ones.

Nut bread is a pleasant accompaniment to a cup of coffee.

Banana Bread

4oz. of butter
2 eggs
1 teaspoon of lemon juice
3 teaspoons of baking powder
1 cup of chopped nuts
8oz. of sugar
1 cup of mashed bananas (about 3)
8oz. of sifted flour
½ teaspoon of salt

Cream the butter and sugar together. Beat the eggs and add them to the creamed mixture. Add the lemon juice to the bananas and stir these into the creamed mixture. Sift the flour, baking powder, and salt together and add this mixture and the nuts to the banana mixture. Bake in a greased loaf tin at 375 degrees F. for 1¼ hours.

Orange Nut Bread

Juice and peel of 1 large orange
Boiling water
1 teaspoon of vanilla
1oz. of melted butter
8oz. of flour
1 teaspoon of baking powder
½ teaspoon of salt
Dates (chopped small)
8oz. of sugar
1 beaten egg
1 teaspoon of soda
½ cup of chopped nuts

Squeeze the orange juice into a measuring cup and add boiling water to fill the cup. Put the orange peel through the mincer and add sufficient dates to make a cupful. Sift the flour, soda, baking powder, and salt together. Place the orange peel and date mixture in a basin and add the orange juice and water mixture. Stir in the vanilla, sugar, and butter. Add the egg, then the flour mixture. Stir in the nuts. Pour into a well-greased loaf tin and bake in a moderate oven (350 degrees F.) for 1 hour.

Pineapple Nut Bread

9oz. of flour
1 teaspoon of salt
1 cup of bran
1½ cups of crushed pineapple
1½oz. of melted butter
6oz. of sugar
3 teaspoons of baking powder
½ teaspoon of baking soda
¾ cup of chopped walnuts
1 well-beaten egg

Sift the flour, sugar, salt, baking powder, and soda together and mix in the bran and walnuts. Beat the egg, add the butter and the pineapple (do not drain off the juice), and add this mixture to the dry ingredients, stirring only enough to dampen the dry ingredients. Pour into a prepared tin and bake in a moderate oven (350 degrees F.) for 1¼ hours. Leave until thoroughly cool before slicing. This mixture makes a large loaf.

Boy's Sleeveless Pullover

MANY busy mothers cannot find much time in their daily household round for knitting, but the boy's sleeveless pullover illustrated is in a straightforward pattern that will appeal to those who can manage only an occasional piece of knitting. The pullover is suitable for a boy about 11 years old.

ABBREVIATIONS: K., knit; p., purl; st., stitch(es); rep., repeat; beg., beginning; dec., decrease; inc., increase; tog., together; cont., continue; patt., pattern.

Materials: 5oz. of 4-ply fingering; 2 No. 9 knitting needles; 4 No. 12 knitting needles.

Measurements: Length, 18½in.; chest, 29in.

Tension: Using No. 9 needles, 6½ st. to 1in.

Front

With 2 No. 12 knitting needles, cast on 92 st. and work 3½in. in k. 1, p. 1 rib, inc. 1 st. at end of last row (93 st.). Change to No. 9 needles and cont. in patt.:—

1st row: K. 1, * k. 3, p. 2, k. 2, p. 2, k. 1, (p. 2, k. 2) twice. Rep. from * to last 2 st., k. 2.

2nd row: P. 3, * k. 2, p. 2, k. 2, p. 3. Rep. from * to end.

3rd row: K. 2, * p. 2, k. 2, p. 2, k. 5, p. 2, k. 2, p. 2, k. 1. Rep. from * to last st., k. 1.

4th row: P. 2, * k. 1, p. 2, k. 2, p. 2, k. 1, p. 1. Rep. from * to last st., p. 1.

These 4 rows form the patt. Cont. in patt. until work measures 11½in., ending with a row on the wrong side.

Shaping Armholes

Cast off 6 st. at beg. of next 2 rows, then dec. 1 st. at both ends of every row until 75 st. remain. Cont. without shaping until work measures 15½in., ending with a row on the wrong side.

Shaping Neck

Next row: Patt. 32, turn.

Cont. in patt. on these 32 st. only, dec. 1 st. at neck edge on every row until 27 st. remain, then dec. 1 st. at neck edge on every alternate row until 21 st. remain. Cont. straight in patt. until work measures 18½in., ending at armhole edge.

Shaping Shoulder

Next row: Cast off 7, patt. to end.

Next row: Patt. to end.

Rep. last 2 rows once. Cast off remaining st. Return to the main st., slip the centre 11 st. on to a spare needle, rejoin wool at needle point to remaining 32 st., and work as given for first side.

Back

Work as given for front to end of armhole shapings. Cont. straight in patt. on 75 st., until work measures 18½in., ending with a row on the wrong side.

Shaping Neck and Shoulders

Next row: Cast off 7 st., patt. to last 51 st., turn. Work on these 17 st. thus:—

Next row: K. 2 tog., patt. to end.

Next row: Cast off 7, patt. to last 2 st., k. 2 tog.

Next row: K. 2 tog., patt. to end.

Cast off remaining st.

Return to main st., slip the centre 27 st. on to a spare needle, rejoin wool at needle point, and work 1 row to armhole edge.

Next row: Cast off 7 purlwise, patt. to last 2 st., k. 2 tog.

Next row: K. 2 tog., patt. to end.

Next row: Cast off 7, patt. to last 2 st., k. 2 tog.

Next row: Patt. to end.

Cast off remaining st.

Armhole Bands

Join shoulder seams. With right side of work facing and using 2 No. 12 needles, k. 112 st. evenly round armhole edge (56 st. on each side of shoulder seam).

Work 1in. in k. 1, p. 1 rib. Cast off loosely in rib.

Neck Band

With right side of work facing and using 4 No. 12 needles, begin at left shoulder seam and k. up 35 st. along neck edge, 11 st. from spare needle, 35 st. along neck edge to right shoulder seam, 5 st. along back of neck edge, 27 st. from spare needle, and 5 st. along back of neck edge (118 st.).

Arrange these st. on 3 needles and work in rounds of k. 1, p. 1 rib for 1in. Cast off loosely in rib.

Making up

Press work lightly on wrong side, using a hot iron over a damp cloth. Join side seams. Press seams.

Choosing Shrubs for the Garden

IF a garden is likened to a house, it may be said that the trees and lawn are the framework of the building, shrubs the main furnishings, and annuals, perennials, and bulbs add the decorative touches. Far too many gardens are unsatisfactory because they depend on the decorative touches for their effect without adequate framework or furnishing. In this article J. S. Say, Horticulturist, Department of Agriculture, Auckland, gives the main uses of shrubs in the garden and discusses points that should be taken into consideration when selecting them. The section on garden work for June is by Elspeth Gray, Horticultural Instructor, Department of Agriculture, Auckland.

MOST gardens have a few shrubs, but very many of them are used ineffectively. Frequently the gardens look as if the shrubs had been bought on the spur of the moment and planted with little thought as to their probable size, shape, and general suitability for chosen positions.

Whether a garden is new or old, such permanent acquisitions as shrubs should be planted with the objective of improving the over-all effect rather than merely adding another attractive plant.

It is not always practicable to buy all the shrubs for a garden at one time, nor is that necessarily desirable, for there is always interest in adding new ones from time to time. To buy on the spur of the moment is one of the excitements of gardening, but the new plant deserves a position where its beauty of form and colour will be enhanced by its blending into attractive surroundings.

Because shrubs vary greatly in shape, size, and colour, they do not lend themselves to planting in geometrical patterns or straight lines but rather to grouping. Provided some knowledge of its habit and requirements is acquired with each shrub and the broad principles of garden layout are not ignored, attractive settings for new shrubs can be found in most gardens.

Uses

The following sections suggest ways of using different kinds of shrubs.

HEADING PHOTOGRAPH: The open sweep of lawn graded to the natural fall of the land and surrounded by shrubs gives privacy and the effect of spaciousness. The creeper-covered car-port is in complete harmony with the garden.

A small front garden where excellent use has been made of shrubs as the basis of a mixed flower border.

Mixed Flower Borders

A mixed flower border is the most satisfactory way of providing colour and interest throughout the year in the garden, especially where space is limited. A few shrubs used with the herbaceous perennials, annuals, and bulbs can be of great assistance. Winter and early spring flowering shrubs are particularly valuable, for there are few other flowers about at those times. Dwarf conifers with bright yellow and golden foliage will brighten the winter garden even in the coldest districts. When shrubs are being planted in a mixed flower border care should be taken to see that they are not smothered by vigorous perennials and annuals.

Specimen Shrubs

Some of the larger shrubs can be used as a focal point in the garden as specimen plants, but, in general, shrubs are not suited to this purpose. Only species or varieties which remain attractive throughout the year and have a symmetrical habit of growth should be chosen.

Foundation Planting

Ideally, house and garden should merge into each other without a clear dividing line. A basal planting consisting largely of shrubs of various heights, sizes, and shapes is the easiest and most effective way of providing this link. A narrow bed planted with dwarf plants does not serve the purpose, as it frequently acts as a distinct dividing line. In general the width of the beds should not be less than 3ft. The height of the shrubs will be governed largely by the height of the windows, but taller varieties or climbers can be used between them.

In many modern homes where large landscape windows are brought down almost to floor level suitable shrubs growing above the bottom of the window can be very attractive when viewed from inside and, by using plants in containers inside the window, the effect of bringing the garden into the room can be obtained.

The peculiar conditions created by the walls, for example, the heat of north walls and the almost complete shade of south walls, call for careful selection of material. On the other hand, the variable conditions make it possible to grow a range of plants which would be unsatisfactory in the open garden. It should be noted that many shrubs, though needing very warm conditions, will not stand the dry root conditions which are often found against north walls.

Owners of wooden houses have an understandable objection to planting shrubs against the walls. Though they make repainting and maintenance difficult, the damage caused to the building is not as severe as is generally thought, but shrubs should not be planted closer to the walls than 2ft. or 3ft., even if they are of permanent materials. Creeping or climbing plants are much more damaging to walls than are self-supporting shrubs.

Shrub Borders

The most effective way of using shrubs in the garden is to group them together into beds or borders. Half-a-dozen shrubs used in this way at the side of the lawn look much better than the same shrubs in little beds dotted about the lawn. In addition lawn maintenance is much easier and the unattractive appearance of some shrubs at certain times of the year is masked.

Shrub borders have several advantages over flower beds and borders, especially for those who do not have a great deal of time to spend in the garden. Though they do not make a bold mass of colour, well-planted shrub borders are always attractive. Very little maintenance is needed and there is no recurring annual cost for replacements.

Shrub borders can be used in many ways: as the main feature of the garden; as a background; as screens to give privacy from the street and neighbours; as divisions between dif-

ferent sections of the garden; in place of hedges; to give shelter from wind; and to cover banks that are too steep or poor for other purposes.

To get the best results from a shrub border, plants should be selected with care. Apart from the choice of those which will be suitable for the locality, soil, climate, and other environmental conditions, thought should be given to the type and purpose of the border. For example, if it is mainly for winter and spring colour to tide the garden over a period when flowers are scarce, varieties that flower at those times should be chosen together with others with coloured and variegated leaves and with coloured stems. If the border is mainly intended for a more or less neutral background to the rose garden, evergreens with not too bright foliage should be used and summer flowering shrubs avoided.

No hard and fast rules can be laid down about the width of the border in relation to the height of the plants, but as a rough guide width should be about equal to the average height of the tallest plants. In general 3ft. to 4ft. should be regarded as a minimum. Fairly tall shrubs can be planted in a bed of that width provided it is backed by a wall or fence and upright rather than spreading varieties are selected. A narrow bed which can be viewed from both sides looks out of proportion if planted with tall material.

When a border is planned, tall shrubs should be selected for the back and graduated down to dwarf and prostrate varieties in front, but a few tall ones should be brought slightly forward to avoid the possibility of a flat appearance. As these become more conspicuous, they tend to act as focal points and consequently only varieties which are attractive the year round should be chosen. No attempt should be made to plant in straight rows, and toward the front dwarf shrubs can be planted fairly close together in groups of three or more if space permits.

All shrubs should be given room to develop so that they do not touch until they are almost fully grown (except where groups of one variety are planted). When planted at the correct spacing a young shrub border always looks sparse, but the urge to fill in the spaces with more shrubs should be resisted.

There are two ways of overcoming this initial bareness. Dwarf annuals and bulbs may be planted among them or fast growing shrubs can be used as fillers. In theory the latter is the better system, but in practice the fillers, which are usually not of great value, are rarely removed until they have dominated the border and spoilt the permanent but slower growing plants.

In a well-planned border the beauty of the individual shrubs should be displayed to the full; yet the border as a whole should be attractive and appear as a unit and not as a collection of individuals. This can be done by a careful blending or contrasting of colours (both foliage and flower), textures, shapes, sizes, and growth habits. To get satisfactory results the border should be planned to scale on paper, well before planting time, and with knowledge of the probable mature sizes of all of the shrubs.

A mixed flower border where contrasting colours and textures of the shrubs and perennials have been used most effectively.

Selection

When shrubs are being selected for the garden many points should be considered to ensure that those chosen are the most suitable. They should not be bought simply because they look well in the nursery row or local seed shop or because they look attractive in another garden or park. They should be bought with a definite purpose in view and to suit the soil and situation where they are to be planted. There is still some scope for buying on the spur of the moment, especially of smaller shrubs and for larger gardens, but haphazard buying without regard to soil or climatic conditions too often leads to disappointment.

It is not practicable to list the many hundreds of shrubs available in New Zealand nurseries and give descriptions of their requirements and characteristics, but buyers should satisfy themselves on the following points:—

Climate: Some shrubs are perfectly hardy and can be grown in the coldest districts, some will stand a few degrees of frost, and others can be grown only in the warmest parts of the country. A number of shrubs introduced from cold countries are not satisfactory in places where cold winters are not experienced. In general only shrubs which are suited to the local climatic conditions should be chosen, though there are exceptions which will be discussed under "situation".

Soil: Though the majority of shrubs will grow well in any average garden, others are not so easily satisfied. Those which require deep, moist soils would never be happy on a dry bank, and those needing acid conditions such as rhododendrons and ericas could not be established on a sandy seaside section. Sometimes it is possible to alter completely the soil conditions to suit the shrubs, but generally this is not practicable for the average gardener.

Situation

Some shrubs prefer partial shade; others demand full shade or full sun. Some will stand winds, but not salt-laden winds; others must have perfect shelter.

It is sometimes possible to grow tender plants in warm, sheltered corners, against sunny walls, or on a

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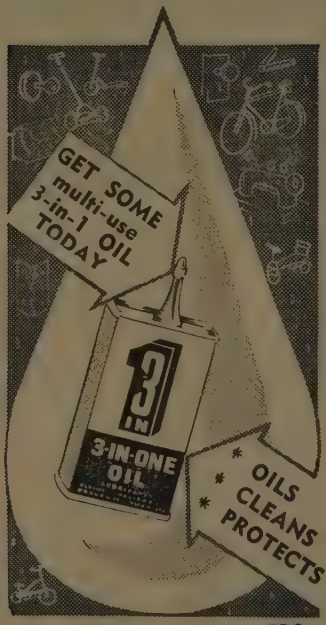

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warm, sunny slope protected from winds. In this way plants not generally suited to the local climatic conditions can be used, but if a shrub needs a great deal of extra attention and care, it may be better to plant a more suitable one.

Growth Habit

It is not easy to divide shrubs into any well-defined groups according to their growth habits and characteristics, but it is as well to have some knowledge of the main divisions and their uses.

Type: As with trees, shrubs may be classed as evergreen, deciduous, or conifer. In any planting it is always advisable to have a fairly solid foundation of evergreens to avoid a bare look during winter. Where a border is primarily intended as a background, screen or shelter evergreens should predominate. Deciduous shrubs should be used where winter shade is undesirable. A large percentage of the shrubs which provide spring flowers and autumn berries and leaves are deciduous. Dwarf conifers are particularly useful for providing winter colour and strong accent points, for they are attractive all the year round.

Flowers: When a shrub border or other planting is being planned the flowering times should be known. The majority of shrubs flower from late winter to early summer. If a large number of flowering shrubs is chosen for a spring border, care should be taken to include sufficient other material to provide interest at other times of the year. Some summer flowering shrubs should be included where the border is the main garden feature. Fragrance should not be forgotten and much pleasure will be given if a shrub with perfume is planted near a path, door, or windows.

Foliage: There are many shrubs which are grown for their beauty of foliage alone. In fact some of the most satisfactory plantings consist entirely of shrubs with attractive foliage. Apart from the wide variations in shades of green there is a tremendous range of shrubs with coloured foliage —silver, grey, yellow, gold, bronze, red, and purple. In variegated shrubs there are numerous combinations of green with white, cream, yellow, and gold. The young growth of a number of shrubs is brightly coloured, usually red or bright shades of green, and, of course, autumn colour should not be forgotten.

Fruit: Shrubs with brightly coloured berries or seed capsules are particularly useful for providing colour in autumn and winter.

Stems: Winter gardens, especially in cold districts, can be brightened with shrubs with brilliant red stems.

Size and shape: These range through every possible gradation from dwarf, prostrate shrubs a few inches high,

Contrasting scenes in two similar housing areas. The houses in the upper illustration were built about 20 years ago, and though there probably has been no conscious planning, the landscape is beginning to assume a mature appearance. With suitable trees and shrubs and good street planting the stark, unfinished appearance of new suburbs could soon be softened and in a few years completely transformed.

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GUMBOOTS

A small, enclosed garden planted almost entirely with annuals, perennials, bulbs, shrubs, and climbers with white flowers or with white or silver foliage.

and perhaps many yards in circumference, to tall, upright varieties. In addition they may be tight and compact, or loose and open.

Texture: This is the effect of the combination of size, shape, and colour of the leaves and the amount of light reflected by them, together with the size, shape, and habit of the plant. It is one of the characteristics of shrubs and trees which is difficult to define, but is of great importance when planning and can perhaps be explained by likening shrubs to various cloths, for example, silk, velvet, worsted, and tweed, which may all be the same colour, but have very different appearances.

Planting

The time and method of planting trees given in last month's "Journal" apply equally to shrubs.

Trees are usually planted singly and the soil preparation is confined to a square yard or so, but when a shrub or mixed flower border is being planted the whole area should be thoroughly prepared. It should be dug as deeply as the topsoil allows and the subsoil should be broken up.

If compost, animal manure, or other organic matter is available it should be worked in through the soil at the same time. This is better than spreading it in a layer as each trench is opened up. A mixture of equal parts of blood and bone and superphosphate or a balanced fertiliser should also be incorporated. Lime, if necessary, may be spread after digging, but must be avoided if acid loving plants are to be grown. Preparation should be completed at least a month before any planting is done. Drainage, which was discussed in an article on page 409 in the October 1956 issue of the "Journal", will, of course, have to be attended to if necessary.

Maintenance

Once planted a shrub border needs very little maintenance. Weeds should be kept down and a dressing of a balanced fertiliser and if possible a mulch should be applied each spring. Shrubs in a well cared for mixed flower border usually need no additional treatment to that given to perennials, etc. Watering should not be neglected, especially during the first year or so and later during very dry periods. If pests such as aphids, thrips, red spider, and scale insects are present, spraying should be carried out. Diseases are usually of little consequence on shrubs.

Pruning

Pruning sometimes presents difficulties. To prune correctly the gardener must know why he is pruning and the shape and growth characteristics of the shrubs he is dealing with. Each shrub must be treated as an individual and hedge shears are not suitable for the work.

Foliage shrubs are not difficult to prune; all that is necessary is to assist them to attain their natural shape and then maintain it. This can usually be done by pinching out young shoots with the fingers or cutting back extra strong growths with secateurs. Dead wood and thin, weak growths should also be removed.

With flowering shrubs pruning is done to promote the production of flowers and at the same time maintain their natural shape and habit. To most people winter means pruning time, but if some flowering shrubs such as forsythia are pruned, there will be no flowers, for the buds are already formed and are waiting to burst forth in spring.

It must be known whether a shrub produces its flowers on the current season's growth or on the previous season's wood. Shrubs which flower on the current season's growth are usually pruned hard back in winter or early spring. They then produce vigorous, fast growing shoots on which the flowers are borne. Examples of this type are buddleia, poinsettia, and fuchsia. If pruning is neglected, the new growths produced each year become shorter, the flowers poor in quality, and the plant tends to become leggy, with a large amount of hard, unproductive wood at the base.

It's all yours

One of these evenings, when you've got a bit of time on your hands take a look round the house. We don't doubt you'll find all the essentials, most of the comforts and some of the luxuries which really make life worth while. And it's all yours. Well, you've earned it, none better. But take a closer look. . . .

Aside from the food in the larder and the furniture, *almost everything which contributes to your present comfort and standard of living had to be imported from overseas.*

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That is the service which is yours today. It did not come by chance; it came because there was — as there had to be — close co-operation between all the interests concerned, shippers and shipowners alike. That co-operation is still the foundation of New Zealand's link with the outside world.

And what are its advantages to you, the producers of New Zealand's wealth? A moment's thought provides the answer. You have four individual Lines working as one for the benefit of all, co-ordinating their separate services and providing, in effect, one great fleet to serve New Zealand's needs. You have the freedom and certainty with which trade flows into and out from New Zealand's ports. You have, finally, the direct result of these endeavours — your standard of living, among the highest in the world. . . .

. . . and that, indeed, is worth preserving

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Another group of shrubs flowers on the wood produced the previous season. These should be pruned immediately after flowering to encourage vigorous growths which will ripen during summer and autumn and flower in spring. Prunus species, flowering currants, and forsythia belong to this group.

Some shrubs flower on old wood, frequently from spurs, for example, hamamelis, chimonanthus. and cydonia. Very little pruning is needed with these. Usually it is sufficient to shorten back the new growths.

Evergreen shrubs grown for their flowers as a rule do not need a great deal of pruning. They should be kept in shape and dead and weak growths removed. Some, such as waratahs and proteas, resent hard pruning and should never be cut back into old wood. They should be pruned after flowering by being cut back to a point where side shoots are arising.

Shrubs grown for their berries should be encouraged to produce the maximum amount of flowers and should be pruned according to the principles set out for those grown solely for flowers.

With a knowledge of their flowering habits it is not difficult to prune the majority of shrubs, but gardeners with any doubts should ask advice from someone with a knowledge of shrubs to avoid disappointment.

Garden Work in June

JUNE and July are the 2 months of the year when least can be done in the garden, though this period gives an opportunity to tidy the garden and repair tools and equipment. The amount of work that can be done in the garden depends mainly on the condition of the soil. If it compacts readily when walked on, it is too wet to work and should be left until it has dried out more.

Deciduous shrubs and trees can be planted as soon as they arrive from the nursery provided that the ground is not too wet. Should this be the case, they should be heeled in until conditions are suitable. Heeling in consists of digging a shallow trench, placing the shrubs at an angle in it, and firming the soil lightly round them. After severe frosts newly planted shrubs should be examined and, if necessary, the soil should be firmed again. The soil often lifts during frosts, exposing the feeding roots of plants, and, if left untended, the exposed roots may die and the shrubs suffer a serious check.

FLOWER GARDEN IN JUNE

Herbaceous plants should be left untouched during winter if they have not already been lifted and divided.

Lawns

New lawns that have not yet been mown can be attended to early in June. Newly established lawns should not be mown closely. A light rolling before the first mowing will help to consolidate the soil and reduce the damage done to the surface of the lawn by the wheels of the mower. If the grass is looking yellowish and unhealthy, the first of the 3-monthly topdressings of sulphate of ammonia and superphosphate may be applied at 3 parts to 1 part by weight respectively. This should be put on at 1oz. to the square yard every 3 months for the first year of the lawn's growth and at least once in spring every succeeding year.

Pruning

Most trees and shrubs are pruned during winter, as there is more time available to devote to this task than at any other season. It should never be done indiscriminately, however, as different varieties require pruning at different times of the year. Early spring flowering shrubs that flower on wood formed the previous season should be pruned after they have finished flowering. If they are pruned earlier, many flower buds will be removed, resulting in a comparatively poor display in spring. Summer flowering varieties that bloom on wood formed in the current season, that is, growth made in spring, may be pruned now if they were not done after flowering. Bush, standard, and climbing roses do best when they are pruned in late winter or early spring, the time decided on depending on the climate.

Farther south where hard frosts are common even in the first part of September they should be left until later than in areas where frosts are less severe. Ramblers are best pruned in summer when they have finished flowering. Evergreen trees and shrubs are best left until early spring, as the cuts will be covered with new growth fairly quickly once the sap has begun to flow.

Shrubs or trees that are being grown in a particular position because of their shape, for example, upright cypress, different varieties of conifers, and ornamental cherries, need minimum attention once they are established. All the pruning that should be necessary is the removal of branches that are spoiling the shape, and this is best done when the trees are in active growth from late spring on.

Tools used for pruning should be sharp. Not only do they make work easier, but they cause less damage to the plants. Blunt secateurs bruise the bark; the wound takes longer to heal and may permit the entry of fungi, causing die-back of the branch.

When pruning, cuts should be made to a bud, a side shoot, or back to the main limb of origin. Where a stump is left with no buds or shoots it will

die and make the shrub look untidy. Limbs that are too thick to be cut easily with secateurs should be removed with a saw and the rough edges trimmed with a sharp knife. To prevent water and fungi entering a wound all larger cuts should be covered with a bituminous paint or with green crude petroleum jelly, though lead paints will give some protection for a shorter time. Coal tar or creosote injures plant tissues.

Bedding Plants

Where the soil is still workable in the northern districts spring flowering plants can still be set out as follows:—

Wallflowers, antirrhinums, Beauty and Ten-week stock, *Primula malacoides*, and sweet william.

Rather than compost or organic manure being added to the soil when planting out at this time of year, a dressing of well-balanced fertiliser should be hoed in before planting. With the colder soil temperatures of winter, compost takes longer to break down and the nutrients will therefore not be available to the plants until the warmer weather of spring.

In addition to the setting out of the above plants seed of late spring and early summer flowering annuals may be sown in warmer areas under a frame. Schizanthus (butterfly flower), cinerarias, and nemesias are among the plants that can be sown now for flowering in late spring.

Over-watering causes damping off of young seedlings so that the soil should be kept just moist and watering stopped during periods of wet, dull weather. Treating the seeds with thiram before sowing helps them to get away to a good start. A pinch of the dust should be placed in a small glass jar with the seeds and shaken vigorously for a few minutes.

Herbaceous Border

Perennials that were not lifted and divided in autumn and also late flowering ones should now be left undisturbed until spring. If they are replanted during winter, no growth will be made and the plants take longer to become established and to start into growth when the temperatures warm up.

Where a mulch was applied during summer it can be dug in now if this has not already been done. An occasional weeding to keep the ground clean should be all the maintenance that is necessary during winter.

Tools

During wet weather garden tools can be looked over to make sure they are in good condition for the coming season. Clean, sharp tools make gardening much easier and when they are properly looked after they last much longer.

Hoes and spades should be kept reasonably sharp and wiping them over with an oily rag after they have been cleaned will keep them free from rust. Lawnmowers can be sent in for sharpening during winter so that they are ready for the first mowing in spring. When they are left until about August there may be a long delay because there will be a number to be sharpened at the one time.

Fertilisers and Sprays

A check should be made on the amounts of fertilisers and sprays that are on hand and where necessary orders put in for fresh supplies. Nothing is more annoying than to have everything ready for an early spray only to find that there is not enough of the required material. Poisonous sprays should be labelled as such and placed out of the reach of children. Some fertilisers, for example nitrate of soda, take up moisture from the air and become hard to break up into small amounts. For this reason they should be stored in airtight containers and not left in a sack or paper bag. A tidy garden shed with clean tools and clearly labelled manures and sprays is an objective well within the reach of the average home gardener.

All photographs by Sparrow.

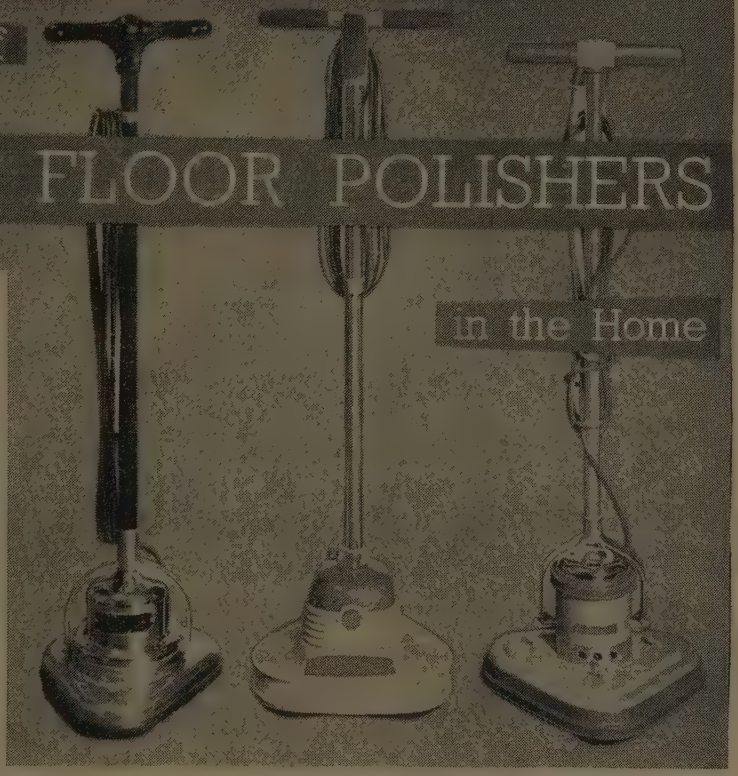
An Easily Made Bookcase

THE woman who is no carpenter can assemble this bookcase in the space of a few minutes and what is more she can take it apart again should she wish to move it to another part of the house. The materials required are even lengths of clean, smoothed timber 1in. thick and 10in. wide. The length will vary according to individual preference or the space the bookcase is to occupy.

Sixteen fire bricks were used in the bookcase illustrated and the shelves of *Pinus radiata* were treated with a clear plastic varnish. There are several types of clear varnish which can be used to seal the wood so that the grain of the timber is shown to the best advantage. These varnishes should be applied carefully according to the manufacturer's directions.

—BETTY M. JOHNSTON, Field Officer in Rural Sociology, Department of Agriculture, Wellington

Value and Use of ELECTRIC FLOOR POLISHERS in the Home



By MAUD B. STRAIN,
Field Officer in Rural Sociology,
Department of Agriculture, Dunedin

AMONG the smaller appliances that can be bought to make housework easier the electric floor polisher must rank close to the top for the work it does. Clean looking, well-kept floors are the pride of any home, but often mean a lot of hard work for someone. A polisher-scrubber, which eliminates the hard work connected with floor care, is as easy to operate as a vacuum cleaner, requires even less maintenance, and is as labour saving with polished floors as is a vacuum cleaner with carpeted floors.

NO part of a home will deteriorate more rapidly if neglected than the floors. They must stand up under the hardest kind of wear, and grit and dirt are continually ground into them. The constant scuffing of feet round doorways and along traffic lanes tends to make these areas especially shabby and worn.

The ideal floor is one that will not show wear but will remain smooth and beautiful at all times with the minimum amount of care. No floor in common use which is not protected with a special finish can meet these requirements.

Wax is the ideal maintenance finish for the usual types of flooring. There are two categories of floor waxes: Polishing and self-polishing. Polishing waxes may be either paste or liquid and contain a solvent; self-polishing waxes are always liquid and contain no solvent. Polishing waxes should not be used on rubber, asphalt tile, or cork flooring, because the solvent may affect such surfaces. The water in self-polishing waxes can be harmful to inadequately sealed wooden or cork floors.

Wax, properly applied, forms a thin, tough, transparent protective film, and the correct way to achieve this film is to apply the wax sparingly and evenly and then buff it up to a high gloss.

Polishing Machines

Buffing to a high gloss is heavy and laborious work if done by hand, but can be done comparatively easily with an electric polisher. Whether the cost of such a machine in a home can be justified depends on the amount of floor space to be polished. When the area is limited to kitchen and bathroom floors the small amount the polisher would be used might not justify the outlay for it. However, for any home with a sizeable area of polished wood or linoleum-covered flooring a polisher will keep the floors in much better condition than could be accomplished by hand and will do this in a fraction of the time and with little effort on the part of the operator.

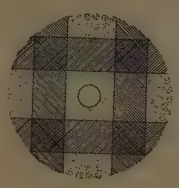
Various types of polishers are available, but all are based on the same principle—that of electrically revolved brushes which rub into the floor (wood or linoleum) polish which has previously been spread either by hand or with a mop or other device.

The main components of most home-type electric floor polishers are: Electric motor and gearbox which drive one, two, or three rotating spindles; interchangeable polishing and scrubbing or scrubbing waxing brushes that fit on the spindles; and felt or lambs' wool buffing pads.

All the machines are capable of applying wax, though this is not always mentioned. Some have special brushes for the purpose; others make use of the scrubbing brushes, either as they are or slightly adapted, but the brushes must be dry and they must be cleaned immediately after use to prevent the wax from hardening on the bristles.

Use of Steel Wool

One maker suggests the use of fine steel wool, which can be purchased in rolls, and cut into strips about 2in. wide and of a length equal to the width of the brushes. Two of these strips are placed in one direction on opposite sides of the central spindle and another two crossing them at right angles (see diagram below). The strips of steel wool are pressed down so that they become partly embedded in the bristles.



If paste wax is to be used, it is spread very thinly on the steel wool much as butter is spread on bread

▲ Parts of floor polisher. A—Position of switch. B—Long handle with hooks for cord storage. C—Position of latch keeping the handle upright when the machine is at rest. D—Motor and gear-box. E—Spring clips which hold the brushes firmly on the spindles.

▲ Under surface of the polisher, showing a brush being removed by pressing the corresponding spring clip E in the illustration at left.

and the whole floor is covered with wax, allowed to dry thoroughly for 20 to 30 minutes, and then polished. If liquid polishing wax is used, the liquid is placed on the floor in small puddles about 2in. in diameter and the machine is guided in straight lines over a small area at a time, the steel wool pads being changed as they become soiled. When the whole floor has been covered it is allowed to dry thoroughly and then polished.

Points of a Good Polisher

A polisher should be capable of spreading a thin, uniform wax film when a solvent-type liquid wax is used, provided the linoleum is perfectly clean and free of any old, previously applied polish.

A smooth, unstreaked wax finish should result after polishing and the machine should be able to polish to within ¼in. of a vertical surface such as a wall. Some polishers have brushes where the outermost row of bristle slants outward to enable them to reach close in to walls and right-angle corners.

With a paste or solvent-type liquid wax a good polisher can make applying, polishing, and buffing easier and give a better finish than can be got by hand. If self-polishing wax is used, a polisher is not necessary for applying or polishing it, but is useful for buffing floors between waxings.

The brushes should be easy to attach and remove without use of tools. The felt pads are attached over the polishing brushes with a snap fastener.

Polishers should be capable of effectively buffing away scuff marks from a polished floor. They do this by producing enough friction to redistribute the wax and erase marks. It would be impossible to create as much friction by hand as is produced by the weight of the machine pressing on buffers whirling round at several hundred revolutions per minute.

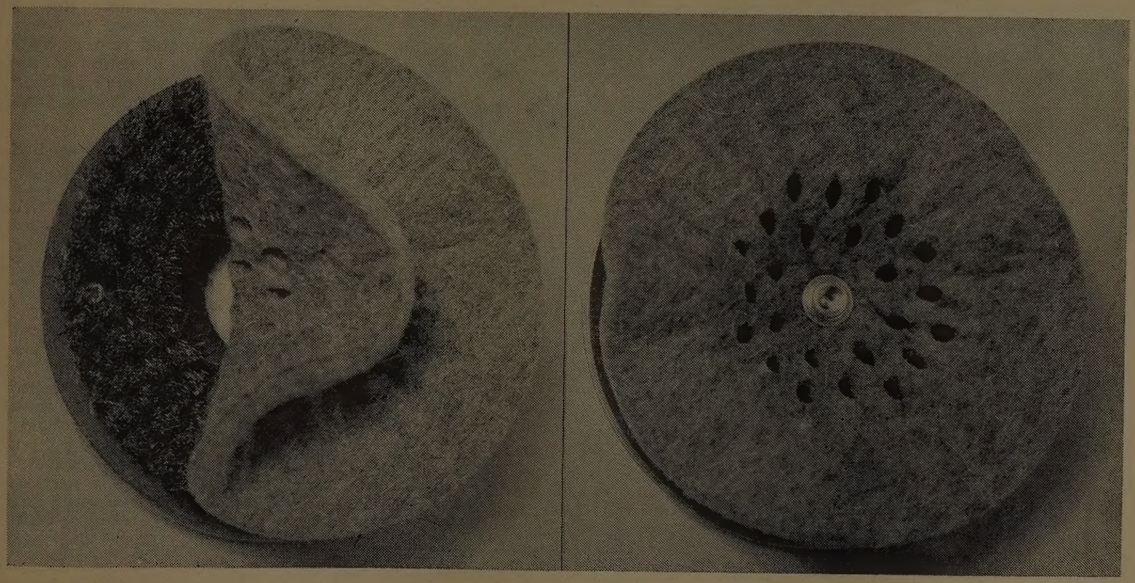
When used for scrubbing a polisher should cause only a minimum of spattering. The machine should not pull to one side or the other to any considerable degree while in operation because trying to oppose the pull all the time is fatiguing.

There should be some means of preventing the machine from skittering over the floor if it should be plugged in while the machine switch is in the "on" position. At worst such behaviour can cause damage; at best it is annoying.

A polisher should not be unduly noisy. It should have a reasonably long cord and a hook or other means of cord storage on the handle. There should be some latching device for holding the handle upright while the machine is at rest.

Using a Polisher

Scrubbing floors more often than is really necessary is undesirable because water, if not used with discretion, can cause damage to wood and linoleum-covered floors. One authority has said that more linoleum floors are scrubbed away than are worn away by normal foot traffic. It is better therefore whenever possible to dry clean them with liquid polishing wax. All surface dust and litter should first be removed with a broom or vacuum cleaner and any obvious dirt marks then wiped off. Liquid wax is next spread thinly over a small area and wiped off again before it has time to dry; the dirt comes away on the cloth. The floor is then polished.



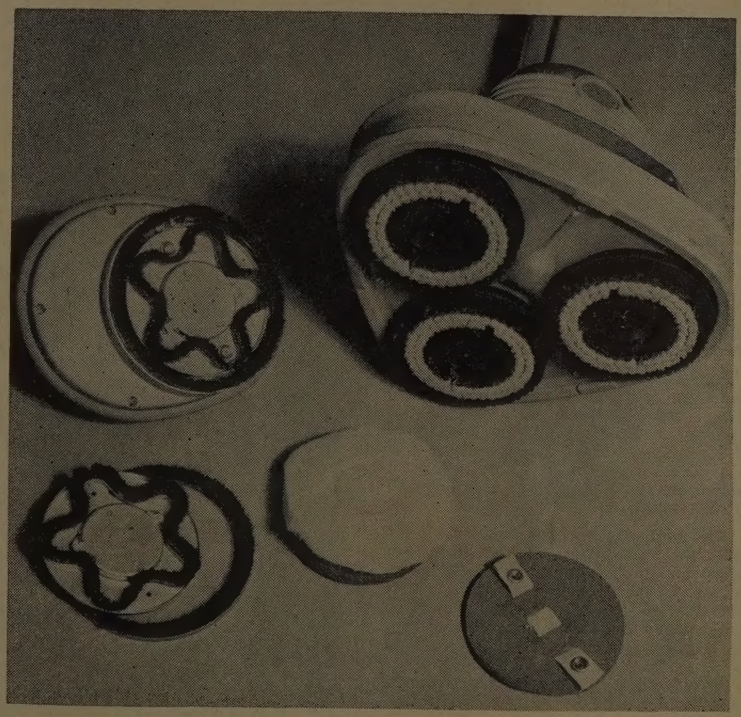
The felt buffing pad is attached over the brush with a snap fastener. This metal fastener does not come in contact with the floor.

If the floor has become so dirty that scrubbing is necessary, a section of it at a time should be washed with warm soapy water or detergent and water. The polisher with scrubbing brushes attached should be moved backward and forward in straight lines over the dampened floor. The brushes revolving at high speed clean off the dirt. Rinsing and drying must be done by hand. A self-squeezing, synthetic-sponge mop or a self-wringing mop will be found convenient.

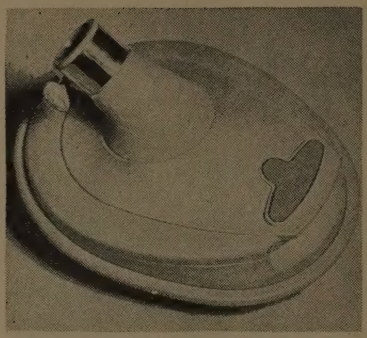
The floor must be thoroughly dry before polish is applied. The plug of the polisher cord should be disconnected from the wall and the scrubbing brushes removed from the polisher. The under surface of the machine should be dried and the polishing brushes fixed in place. The scrubbing brushes should be rinsed out and dried before being put away.

Polish should be applied sparingly and evenly by hand or with the machine, as a thick application cannot be brought to a hard, dry polish and is apt to be smeary. It is always well to remember that two thin coats will give a much better and longer-lasting finish than can be obtained by using one heavy application.

When the polish has dried the polisher should be run backward and forward across the grain and then with the grain until the finish is smooth and glossy. If a higher polish is desired, the felt pads can be snapped in place over the polishing brushes and the floor buffed up. The felt pads should



Arrangement of the brushes in a 3-brush polisher. Also shown are scrubbing brushes and the felt buffing pad and lambs' wool pad for use with the polisher attachment.



This polisher is an extra attachment for one make of vacuum cleaner. It has a thumb screw for adjusting to various pipe sizes. Its revolving brush is driven by air pressure from the vacuum cleaner motor. The attachment has both a scrubbing and a polishing brush and is suitable for small areas and for furniture.

Another polishing attachment for a vacuum cleaner. This is also driven by air pressure from the motor of the vacuum cleaner. For successful operation strong suction (or blowing) is required.

be used only after the surface has been polished with the brushes, as otherwise the friction is too great and the felt pads either become unfastened and shoot across the floor or the motor stalls.

Practical Details

Machine scrubbing is much less strenuous than getting down on hands and knees to scrub with a brush, but it could be less effective on a floor with deeply ingrained dirt marks which if scrubbed by hand would need hard scrubbing or the use of an abrasive. Not as much pressure can be exerted by the machine on any individual marks without risk of stalling or damaging the motor as can be exerted with hard pressure on a scrubbing brush. To ensure a successful result it is advisable to look over the floor and remove any ingrained dirt marks. If this is done, the polisher will turn out a much better job than can be done by hand.

Experience has shown that using the machine for scrubbing does not save much time, because so many of the operations must be done by hand, but it does save effort. For polishing the machine saves time and eliminates the strenuous work usually associated with a highly polished floor.

The higher gloss produced by a floor polisher does not make the floor slippery; in fact, it is less likely to be slippery, because the machine buffs the wax to a hard, dry finish. A floor is slippery and hazardous when wax is applied too thickly, is not allowed to dry thoroughly before buffing, or is insufficiently buffed. The frequency with which a floor needs to be waxed depends on the amount of traffic through the room, but the surface should last for 3 to 4 months. The traffic lanes may need more frequent attention.

Care should be taken not to allow layers of wax to accumulate near the walls and in other places where traffic is negligible, because the dark patches of combined dust and wax are difficult to remove. Polishing wax can be removed by cleaning the floor with a cloth dampened with turpentine or paint thinner and then washing with mild soap and warm water. Self-polishing wax can be removed with mild soap and warm water and fine steel wool if necessary.

Maintenance

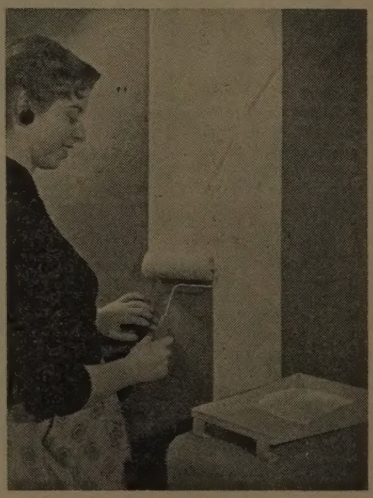
The maker's instructions for a polisher should be followed in every detail. A polisher should require little servicing apart from attention to the motor. As this is sealed inside the head of the machine, it is protected from damage by dirt or wax.

Scrubbing brushes should be washed after use. Polishing brushes and buffing pads must be kept clean, as an accumulation of hardened wax will reduce their effectiveness. Brushes should be washed in warm water and soap or detergent, rinsed several times until the water is clean, shaken to remove excess water, and dried.

Felt pads can be cleaned in dry-cleaning fluid or they may be washed. Before felt and lambs' wool pads are washed their outline should be traced on stiff paper. After the pads have been washed and rinsed thoroughly excess water should be squeezed out and the pads laid over the pencil outline and stretched to their original shape before drying. Lambs' wool pads need fluffing up several times while drying to restore them to their original softness.

When the polisher is not in use it should not stand on its brushes, because its weight will cause them to spread and become distorted. The polisher is best hung on a hook, but if it must be on the floor, the head should be tilted so that it stands on one side. If this is not possible, the brushes should be removed before the polisher is stored.

Easy Way of Keeping Clean the Tin for a Paint Roller



THE tin used to hold the paint when painting is being done with a roller is easily kept clean and ready for a quick change from one colour of paint to another if it is lined with aluminium foil, rolls of which are now readily available at a reasonable price. The paint-soiled foil can be removed from the tin and disposed of easily and quickly.

—EVELYN E. MOORE, formerly Field Officer in Rural Sociology, Department of Agriculture, Palmerston North

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